COTTAGERS SELF-HELP PROGRAM
ENRICHMENT STATUS OF SEVENTY-NINE LAKES IN THE SOUTHEASTERN REGION OF ONTARIO

1977

Ministry of the Environment
Ontario

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Technical Support Section

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INDEX

ABSTRACT

This report presents Secchi disc and chlorophyll data collected from 92 lakes in the Southeastern Region of Ontario during the summer of 1977. An attempt is made to define the enrichment status of 79 of these lakes for which 6 or more sets of measurements are available. The data were collected through the assistance of volunteers who took Secchi disc readings and water samples from lakes on which they are situated. The results provide the Ministry of Environment with an excellent means of monitoring water quality in our recreational lakes and of investigating any cases of deteriorating water quality and suggesting possible remedial action.

ACKNOWLEDGEMENT

The Southeastern Region of the Ministry of the Environment gratefully acknowledge the assistance of the numerous cottagers, lake-side residents, staff of the Ministries of Natural Resources and Environment, and the staff and students of Sydenham High School who volunteered their time to undertake the Secchi disc visibility readings and water sampling for the 1977 Self Help Program.

INTRODUCTION

Ontario has some 250,000 inland lakes and borders on 4 of 5 Great Lakes. The accessibility of lakes on the Canadian Shield in Southern Ontario to urban areas has resulted in extensive development of summer cottages around the lakes. Additionally, during the summer many thousands of tourists and vacationers spend weekends and vacations at resorts and campgrounds.

Over the past years, an increasing awareness of a concern for problems of water quality impairment in our recreational lakes has materialized. The Ontario Ministry of Environment and other government agencies involved in the control and management of shoreline development of cottages and resorts are concerned with the maintenance of good water quality. In 1970, the Ontario Ministry of Environment established a recreational lake program which is a continuing study to collect and assess data on the lakes in the province to ensure that future development and recreational use of these waters will be well managed to protect their quality.

With the many hundreds of lakes in our region, we do not have the resources to conduct intensive surveys on all lakes annually, nor are such surveys necessary to monitor water quality of recreational lakes on a routine basis.

Water clarity is one of the most important characteristics of a lake from aesthetic and recreational points of view. Water quality is affected by the abundance of phytoplankton (microscopic algae suspended in the water) in a lake. The growth of phytoplankton is mainly dependent on the nutrients present to fertilize it. The key nutrient is phosphorus. This is present through natural processes, but the level can be greatly increased through man's activities.

In 1971, a relatively simple but effective "Self Help Program" was introduced in which cottager's associations and individual lake residents volunteered their time to measure the clarity of their lake and to collect water samples at weekly intervals. The volunteers are supplied the necessary sampling equipment, bottles and instructions and are asked to ship the water samples to the nearest Ministry of the Environment laboratory where they are analysed for their algae content as reflected by chlorophyll concentrations. The success of the program is exemplified by the fact that the number of lakes included in the program has increased from 12 in the first year of its operation to almost 100 in the Southeastern Region, alone, in 1977.

This report presents the data collected from 92 lakes in the Southeastern Region of Ontario during the summer of 1977

(see table 1), incorporates the information into a graphical relationship for 79 lakes with 6 or more sets of measurements, and comments on the findings in an attempt to define the degree of aquatic enrichment or trophic status of each lake. Appendix A provides a brief explanation of water quality problems in recreational lakes. The Southeastern Region includes Hastings and Renfrew Counties and extends east-ward to the Quebec border.

Table 1: Lakes in the Southeastern Region which were sampled in 1977 as a part of the Self-Help Program.

LAKE		COUNTY(S)	TOWNSHIP(S)
1.	Adams	Lanark	North Burgess
2.	Ashby	Lennox & Addington	Ashby
3.	Baptiste	Hastings	Herschel
4.	Bass	Leeds	Rear of Leeds & Lansdowne
5.	Batelle	Hastings	Faraday
6.	Bellamy	Leeds	Bastard, Kitley
7.	Big Gull(Clarendon)	Frontenac	Clarendon, Barrie
8.	Big Rideau	Lanark, Leeds	North Burgess, North Elmsley, South Burgess, South Elmsley
9.	Black	Frontenac	Olden
10.	Bobs	Frontenac	Bedford
11.	Boulter	Hastings	McClure
12.	Buck - North Bay	Frontenac	Loughborough, Bedford, Storrington
13.	Carson	Renfrew	Jones, Sherwood
14.	Charleston	Leeds	Rear of Yonge and Escott and Lansdowne
15.	Christie	Lanark	Sherbrooke, Bathurst
16.	Clear	Renfrew	Sebastopol
17.	Clear	Leeds	South Crosby
18.	Clear	Frontenac	Bedford
19.	Collins Bay	Frontenac	Kingston
20.	Coulonge	Renfrew	Westmeath
21.	Cranberry	Frontenac	Storrington
22.	Cronk	Frontenac	Loughborough
23.	Crow	Frontenac	Bedford
24.	Crowe	Hastings, Peterborough	Marmora, Belmont

LAKE		COUNTY(S)	TOWNSHIP(S)
25.	Dalhousie	Lanark	Dalhousie
26.	Desert	Frontenac	Loughborough
27.	Devil	Frontenac	Bedford
28.	Dore	Renfrew	Wilberforce
29.	Draper	Frontenac	Loughborough
30.	Eagle	Frontenac	Olden, Hinchinbrooke
31.	Ellens	Renfrew	Brougham
32.	Gananoque	Leeds	Rear of Leeds & Lansdowne Front of Leeds & Lansdowne
33.	Glanmire	Hastings	Tudor
34.	Graham	Leeds	Front of Yonge
36.	Graphite	Hastings	Monteagle
37.	Green	Renfrew	Brougham
38.	Grippen	Leeds	Rear of Leeds
39.	Hambly (Silver)	Frontenac	Portland
40.	Hay Bay	Lennox & Addington	Fredricksburg
41.	Howes	Frontenac	Portland
42.	Hurds	Renfrew	Bagot
43.	Indian	Leeds	South Crosby
44.	Inverary	Frontenac	Storrington
45.	Joeperry	Lennox & Addington	Abinger
46.	Kamaniskeg	Hastings, Renfrew	Bangor, Sherwood
47.	Kennebec	Frontenac	Kennebec
48.	Limerick	Hastings	Limerick
49.	Little Black	Frontenac	Portland
50.	Little Long	Frontenac	Loughborough
51.	Little Silver	Lanark	South Sherbrooke
52.	Long	Frontenac	Olden, Hinchinbrooke
53.	Loughborough	Frontenac	Storrington

LAKE	COUNTY(S)	TOWNSHIP(S)
54. Lower Beverly	Leeds	South Crosby, Bastard
55. Mackie	Frontenac	Miller
56. Mazinaw	Lennox & Addington	Abinger
57. Mink	Renfrew	Wilberforce
58. Mississippi	Lanark	Drummond, Beckwith, Ramsay
59. Moira	Hastings	Huntington
60. Mosque	Frontenac	Miller, Clarendon
61. Muskrat	Renfrew	Westmeath
62. Olmstead	Renfrew	Ross
63. Opinicon	Frontenac, Leeds	Bedford, Storrington, South Crosby
64. Ottawa River	Prescott	Hawkesbury East
65. Otter	Leeds	Bastard, South Elmsley
66. Otty	Lanark	North Burgess, North Elmsley
67. Palmerston	Frontenac	Palmerston, South Canonto
68. Papineau	Hastings	Wicklow, Bangor
69. Patterson	Lanark	Dalhousie
70. Pike	Lanark	North Burgess
71. Presqu'ile Bay	Prince Edward	Ameliasburgh
72. Round	Renfrew	Hagarty, Richards
73. Salmon Trout	Hastings	Monteagle
74. Sharbot	Frontenac	Olden
75. Silver	Frontenac, Lanark	Oso, South Sherbrooke
76. Spectacle	Renfrew	Dickens, Nipissing, Jones
77. Spring	Frontenac	Portland
78. St. Andrew	Frontenac	Hinchinbrooke
79. Steenburg	Hastings	Limerick, Tudor

LAKE		COUNTY(S)	TOWNSHIP(S)
80.	St. Peter	Hastings	McClure
81.	Sydenham	Frontenac	Loughborough
82.	Temperance	Leeds	Rear of Yonge & Escott
83.	Thirty Island	Frontenac	Bedford
84.	Troy	Leeds	South Crosby
85.	Twin Sister	Hastings	Marmora
86.	Upper Rideau	Leeds	North Crosby
87.	VanLuven	Frontenac	Portland
88.	Verona	Frontenac	Portland
89.	White	Lanark, Renfrew	Darling, Bagot & McNab
90.	White	Frontenac	Olden
91.	Whitefish	Leeds	South Crosby, Rear of Leeds & Lansdowne
92.	Wolfe	Frontenac, Leeds	Bedford, North Crosby
93.	Wollaston	Hastings	Wollaston

There is no lake number 35.

METHODS

Volunteers for the Self Help Program contacted the Ministry of Environment and were provided with a Secchi disc, a water sampling device, bottles and detailed sampling instructions. The Secchi disc is a simple device which measures the transparency of water in a lake. It is a steel plate, 20 centimeters in diameter and painted in alternating black and white quandrants, which is lowered into the water on a graduated line until the quadrants can no longer be distinguished. The depth is noted and the disc is raised slowly until the quadrants are just again visible - again the depth is noted. The average of these two depths is termed the Secchi disc visibility depth. As depicted in Figure 1, Secchi disc depths are substantially greater in lakes having low phytoplankton (microscopic free floating algae) numbers than in lakes characterized by high algal densities. Secchi disc readings were taken as often as possible during the summer in the deep open water zones of the lakes. A commonly used measure of the amount of algae per unit volume of water is to separate the algae from a water sample onto an extremely fine pored filter, and to chemically measure the concentration of a green pigment called chlorophyll a on the filter. All green plants, including algae, contain this pigment which traps the energy of light in photosynthisis. The higher the chlorophyll a, the higher is the algal concentration in the water.

The depth at which algae cease to occur in a lake, owing to insufficient light penetration to sustain photosynthesis, can be roughly estimated by twice the Secchi disc visibility depth. Water samples for chlorophyll analyses were collected by lowering a narrow mouthed bottle (1 litre capacity) in a weighted sampler through the zone of effective algal production as determined by doubling the value of the Secchi disc depth. The speed of lowering and raising the sampler was regulated by trial and error repetition so that the bottle was just filled as it ascended to the surface. In this manner a composite water sample equally representative of all depths of the measured water column was collected. The water samples were preserved immediately after collection with a 2% magnesium carbonate suspension to minimize degradation of the chlorophyll pigment, and were delivered as soon as possible, usually within a day or two, to a Ministry of Environment laboratory. They were filtered using a 1.2 micron filter paper, wrapped in aluminum foil to avoid light from reaching the residue and refrigerated pending final analysis by the Ministry's Laboratory Services Branch in Toronto.

Secchi readings and water samples for chlorophyll analyses were collected at weekly or bi-weekly intervals over as much as possible of the ice-free season, depending on the samplers' availability at the lakes.

The "Secchi Disc Reading" is obtained by averaging the depth at which a 20cm (8") dia. black and white plate, lowered into the lake just disappears from view and the depth where it reappears as it is pulled up.

Most of the free-floating algae are suspended in the illuminated region between the lake surface and 2 times the Secchi disc reading.

Clear, algae-free lake: Secchi disc readings tend to be greater than 3m (9 feet).

Turbid or algae-rich lake: Secchi disc readings tend to be less than 3m (9 feet).

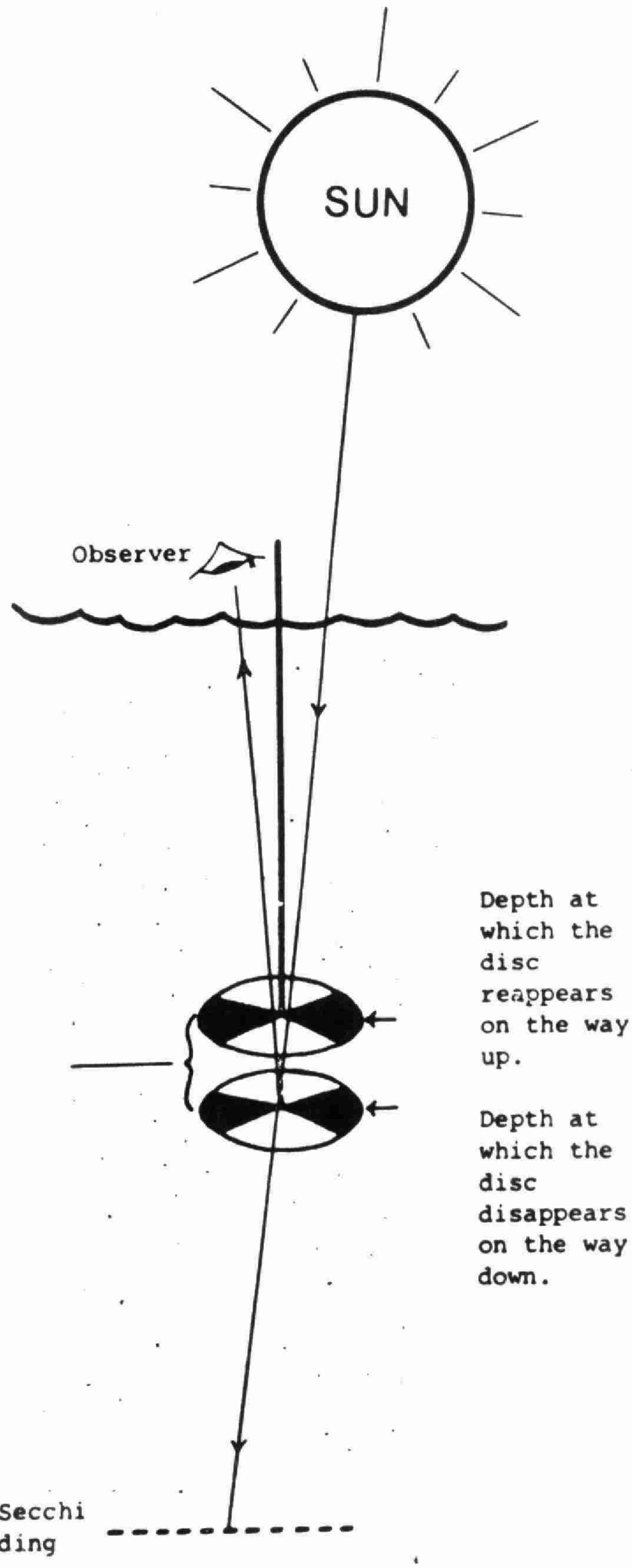


Figure 1: Diagram illustrating the use of a Secchi disc to measure water clarity.

DISCUSSIONS OF RESULTS

The mean Secchi disc visibility depths and chlorophyll values for 79 lakes with 6 or more sets of measurements are summarized in Table 2, and the individual results for all 92 lakes sampled during 1977 are presented in Table 4. Some lakes are represented by more than one sampling station. This is necessary for lakes that are separated into two or more basins (Loughborough Lake, Spectacle Lakes) or that are comprised of a number of bays (Bob's Lake, Mosque Lake) which act independently from a water quality point of view.

It should be recognized, that in many cases, the lakes are sampled during the summer months only, and therefore the absence of heavy algal growths in the spring and fall cannot be confirmed. Some discretion should also be exercised in comparing some of these lakes since the dates, numbers and regularity of measurements may vary considerably from one lake to the other. For example, only 6 sets of measurements were obtained from July 18 to August 25 for Presqu'ile Bay, while 51 sets were obtained from May 23 to October 30 for White Lake. Consequently, a more realistic appraisal can be made of the enrichment status of White Lake than of Presqu'ile Bay. No attempt is made to define the enrichment status of lakes with less than 6 sets of measurements and those lakes are omitted from the following discussion, Tables 2 and 3, and Figure 2.

Table 2: Mean values for Secchi disc visibility (meters) and chlorophyll a (micrograms per litre) data collected on six or more occasions from 79 lakes in the Southeastern Region during 1977.

LAKE	SECCHI DISC (meters)	CHLOROPHYLL a (ug/1)	NUMBER OF MEASUREMENTS
1. Adams	3.9	3.2	9
2. Ashby	6.8	1.3	14
3. Baptiste	3.6	2.4	11
4. Bass	6.6	1.0	9
6. Bellamy	2.2	1.4	8
7. Big Gull(Clarendon)	4.6	2.0	8
8. Big Rideau	4.0	1.4	33
9. Black	5.0	1.3	18
10. Bobs - Buck Bay B	3.8	3.5	10
- Mud Bay A	3.8	2.5	6
11. Boulter	4.0	1.0	8
12. Buck - North Bay	3.5	2.3	19
13. Carson	6.3	1.3	8
14. Charleston	4.0	2.2	24
15. Christie	4.4	3.9	9
16. Clear	3.5	1.8	9
17. Clear	4.2	2.2	9
19. Collins Bay	3.3	3.2	7
20. Coulonge	3.0	1.5	9
21. Cranberry	2.2	7.6	7
23. Crow	4.8	2.2	9
25. Dalhousie	4.1	1.6	10
26. Desert	4.9	1.7	23
27. Devil	4.8	1.7	20
28. Dore	4.8	2.0	11

LAKE		SECCHI DISC (metres)	CHLOROPHYL a (ug/1)	NUMBER OF MEASUREMENTS
29.	Draper	5.0	1.5	18
30.	Eagle	4.3	1.3	6
31.	Ellens	3.5	2.2	13
32.	Gananoque	2.2	3.1	14
33.	Glanmire	3.4	1.9	16
34.	Graham	1.1	2.9	7
36.	Graphite	3.6	2.2	9
37.	Green	8.3	0.7	11
38.	Grippen	2.7	2.1	10
39.	Hambly(Silver)	3.1	3.7	9
40.	Hay Bay	1.1	16.6	12
41.	Howes	2.4	4.1	18
42.	Hurds	4.7	2.1	12
43.	Indian	3.6	2.0	7
45.	Joe Perry	4.2	2.5	6
46.	Kamaniskeg - east of Mask Is.A	5.1	1.4	19
	- west of Mask Is.B	5.1	1.5	18
47.	Kennebec	3.7	1.9	18
48.	Limerick	4.7	1.5	8
51.	Little Silver	4.2	5.0	10
52.	Long	2.4	4.7	7
53.	Loughborough - East Basin B	2.8	3.7	17
	- West Basin A	3.4	2.2	16
54.	Lower Beverly	2.4	5.2	18
55.	Mackie	6.3	1.8	12
56.	Mazinaw	5.7	1.2	29
57.	Mink	3.5	1.5	12

LAKE		SECCHI DISC (metres)	CHLOROPHYLL a (ug/1)	NUMBER OF MEASUREMENTS
58.	Mississippi	3.4	1.8	28
59.	Moira - East Basin	2.4	7.2	13
60.	Mosque	4.8	2.1	27
61.	Muskrat	1.7	10.3	14
62.	Olmstead	6.3	1.4	12
63.	Opinicon	2.8	2.6	13
64.	Ottawa River	1.7	1.9	11
65.	Otter	3.0	2.1	19
66.	Otty	4.0	1.7	35
67.	Palmerston	7.1	1.6	11
70.	Pike	3.1	4.0	6
71.	Presqu'ile Bay	2.6	2.2	6
72.	Round	4.6	2.2	6
74.	Sharbot - West Basin	4.2	1.7	18
75.	Silver	3.5	1.6	19
76.	Spectacles - North - Basin A	3.3	2.4	13
	- South Basin B	4.9	1.8	10
78.	St. Andrews	1.8	6.8	13
79.	Steenburg	4.7	2.0	9
81.	Sydenham(not including Eel Bay)	5.0	3.4	18
82.	Temperance	1.2	8.9	18
83.	Thirty Island	5.0	2.6	14
84.	Troy	1.7	6.9	13
85.	Twin Sister - West Basin	3.6	1.9	8
86.	Upper Rideau	2.6	5.2	9
87.	Vanluven	1.7	2.6	15

LAKE		SECCHI DISC (metres)	CHLOROPHYLL $\underline{a}$ (ug/1)	NUMBER OF MEASUREMENTS
88.	Verona (Rock)	2.1	7.0	12
89.	White	2.8	3.6	49
90.	White	4.6	1.4	10
91.	Whitefish	2.6	4.4	16
93.	Wollaston	5.0	1.2	7

The mean Secchi disc visibility depths of lakes that were sampled on 6 or more occasions were lowest in Hay Bay and Graham Lake (1.1 meters*).

The most transparent waters were Green Lake (8.3 meters), Palmerston Lake (7.1 meters), Ashby Lake (6.8 meters), and Bass Lake (6.6 meters). Lakes with a mean Secchi disc visibility depth exceeding 5 meters have relatively little phytoplankton in their water column and hence have very little biological enrichment. These lakes are termed oligotrophic. Oligotrophic lakes have a low rate of nutrient supply relative to their volume and are almost invariably large deep basins. Secchi disc readings between 3 meters and 5 meters typify most of our lakes, 42 from the 1977 Self Help Program, and are indicative of a moderate amount of enrichment. These lakes are termed mesotrophic and are generally mid-sized basins with maximum depths under 50 meters. Lakes with Secchi readings less than 3 meters are probably eutrophic and exhibit a reduction of light transmission due in part to a high concentration of algae suspended in their waters. These lakes are often shallow and have a high rate of nutrient supply in relation to their volume. The mean Secchi disc visibility depth for all 83 basins of the 79 lakes in 1977 was 3.8 meters.

* Multiply meters by 3.28 to obtain feet.

A wide range of mean chlorophyll concentrations was observed for the 79 lakes with 6 or more sampling dates. The lowest chlorophyll concentrations were found in Green Lake (0.7 ug/l), Bass Lake (1 ug/l) and Boulter Lake (1 ug/l). Thirty other lakes also had a seasonal mean concentration less than 2 ug/l. Mean chlorophyll concentrations between 2 ug/l and 5 ug/l were observed in 35 lakes. The highest mean values were found in Hay Bay (16.6 ug/l), Muskrat (10.3 ug/l), Temperance (8.9 ug/l), Cranberry (7.6 ug/l), Moira (7.2 ug/l), Verona (7.0 ug/), Troy (6.9 ug/l), St. Andrews (6.8 ug/l), Lower Beverly (5.2 ug/l), Upper Rideau (5.2 ug/) and Little Silver (5.0 ug/l) Lakes. The average mean chlorophyll concentration for the 79 lakes was 2.9 ug/l.

Experience indicates that lakes with mean concentrations between 0 and 2 ug/l indicate low algal densities and very little biological productivity. Concentrations between 2 and 5 ug/l, characterize most of our recreational lakes and although moderately high may be considered acceptable for most water oriented sports. Levels exceeding 5 ug/l, on a seasonal average, reflect high algal densities. At these higher densities, nuisance accumulations of algae may occur occasionally and detract from the aesthetic appeal of the water and interfere with lake related recreation such as swimming and water sking.

Nuisance levels of algae or "algal blooms" were reported on 30 Island, Moira, Muskrat and Temperance Lakes during the summer and they may have occurred on other lakes as well.

As pointed out earlier, Secchi disc readings indicate the depth at which light penetrates into a lake and chlorophyll a is a photosynthetic green pigment in algae. Since light penetration is affected by the amount of algae suspended in the water, a good co-relation has been found to exist between Secchi disc readings and the amount of chlorophyll a in a series of lakes of varying degrees of enrichment. The curve in Figure 2 depicts this relationship for a large number of data sets collected from many lakes in the province.

Oligotrophic lakes, which allow significant light penetration and have low chlorophyll levels, lie on the vertical arm of the curve in the upper left of the graph, while points for eutrophic or highly enriched lakes, characterized by poor water clarity and high chlorophyll concentrations, are situated along the horizontal arm of the lower right area of the graph. Data for mesotrophic or moderately productive lakes are dispersed about the middle section of the curve.

The 79 lakes in the 1977 Self Help Program are positioned on Figure 2 according to their mean Secchi disc visibility depths and chlorophyll concentrations. Some lakes (Bob's,

FIGURE 2: The relationship between mean Secchi disc visibility and chlorophyll a concentration for 79 lakes with six or more sets of data included in the Southeastern Region Self-Help Program 1977.

a) All 79 lakes

b) 52 lakes in midsection of curve only

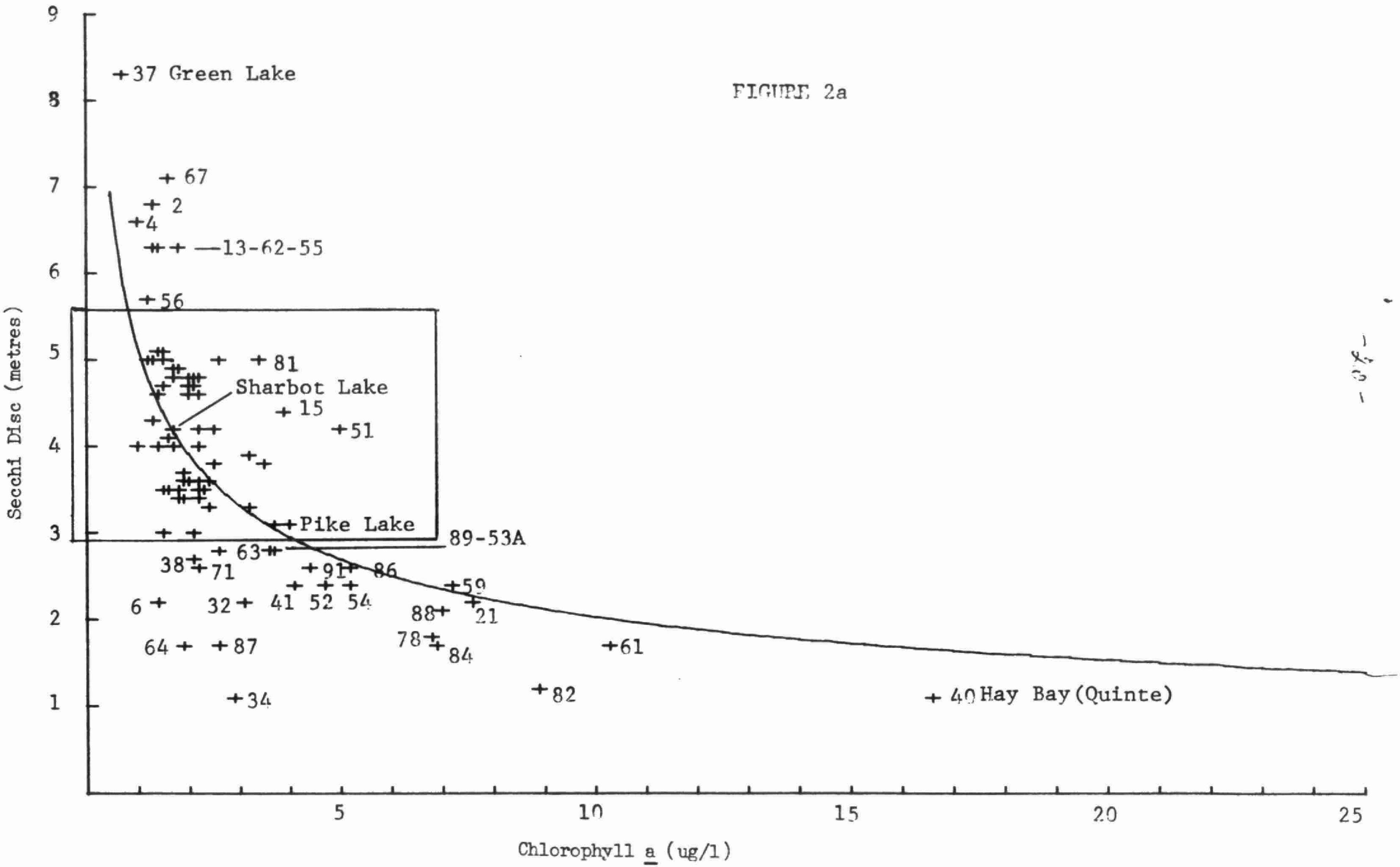


FIGURE 2a
37 Green Lake
67
2
4
13-62-55
56
81
Sharbot Lake
15
51
Pike Lake
89-53A
63
38
71
91
86
59
6
32
41
52
54
88
21
64
87
78
84
61
82
34
40 Hay Bay (Quinte)
Secchi Disc (metres)
Chlorophyll a (ug/1)
1
2
3
4
5
6
7
8
9
5
10
15
20
25

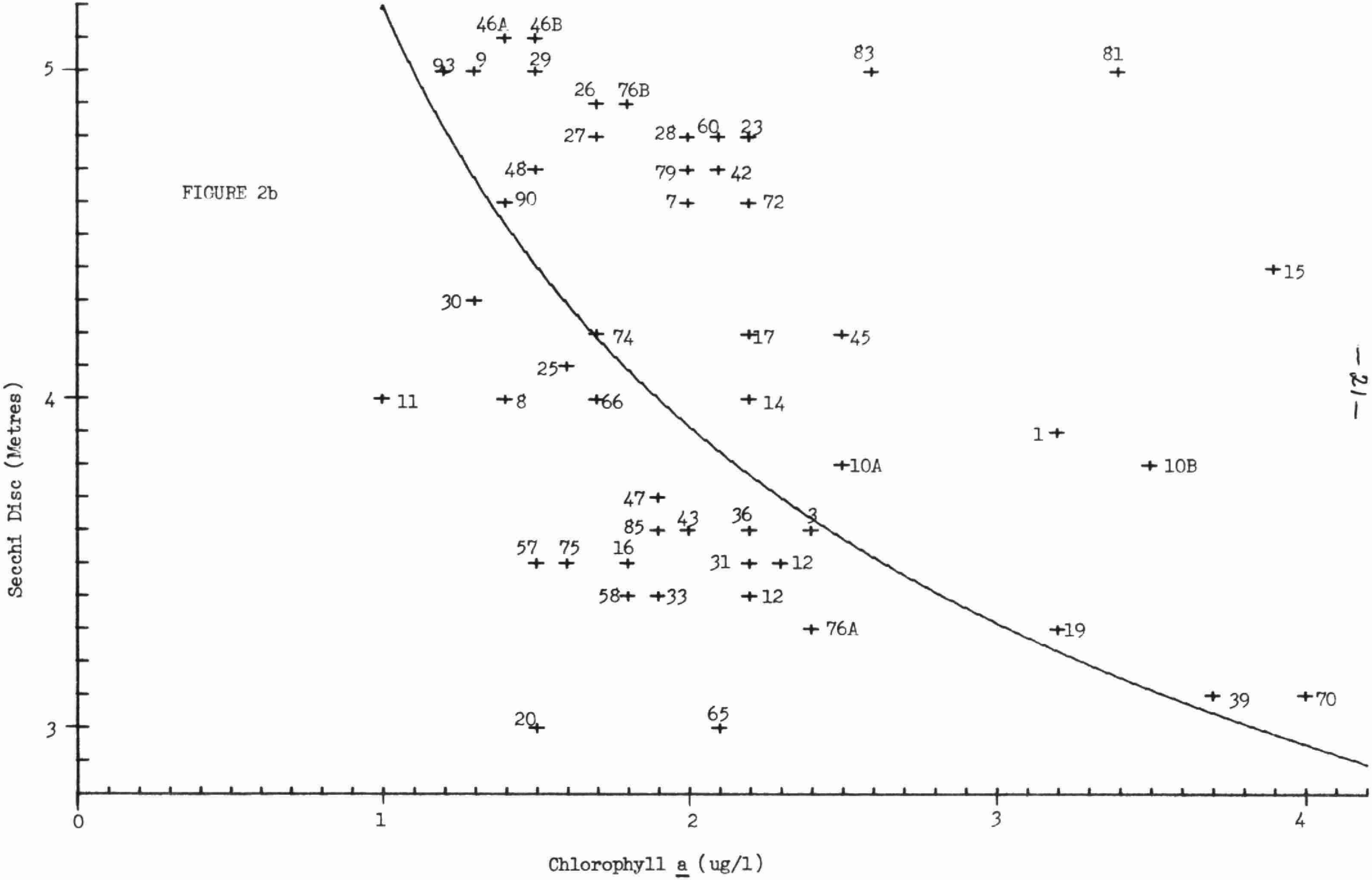

Secchi Disc (Metres)
Chlorophyll a (ug/l)
0
1
2
3
4
5
46A
46B
93
9
29
83
81
26
76B
27
28
60
23
48
79
42
7
72
90
15
30
74
17
45
25
11
8
66
14
1
10A
10B
47
85
43
36
3
57
75
16
31
12
58
33
12
76A
19
39
70
20
65

FIGURE 2b

Kamaniskeg, Loughborough, and Spectacle) are represented by 2 points. The lakes and/or their basins are identified on Figure 2 by numbers according to Table 2 of this report.

Palmerston (#67), Ashby (#2), Bass (#4), Carson (#13), Olmstead (#62), Mackie (#55) and Mazinaw (#56) are situated near Green Lake (#37). Green Lake, with a mean Secchi disc depth of 8.3 meters and a chlorophyll concentration of approximately 1 ug/l, was the most oligotrophic lake in the 1977 program. The majority of lakes are clustered about the intermediate section of the curve near Sharbot Lake (#74); an oligotrophic lake on the Canadian Shield, and Pike Lake (#70); a moderately productive lake situated near the transitional zone between the Shield and Palaeozoic sedimentary rocks of the Ottawa-St. Lawrence Low Land. All lakes are well removed from the highly enriched waters of Hay Bay (#40) - an enbayment off the Bay of Quinte in Lennox and Addington County.

In general lakes with the lowest chlorophyll levels had the best water clarity. However Sydenham (#81), Christie (#15) and Little Silver (#51) are somewhat above or to the right of the established curve. These lakes maintain fairly good water clarity, well over 4 meters, as measured by a Secchi disc in spite of relatively high standing crops of algae as

reflected by seasonal mean chlorphyll a concentrations of 3.4, 3.9, and 5 ug/l, respectively. On the other hand, a number of lakes, Bellamy (#6), Gananoque (#32), Vanluven (#87), Graham (#34), Temperance (#82) and the Ottawa River (#64) experience less water clarity than would be expected on the basis of their summer mean chlorophyll concentrations alone. The Ottawa River contains coloured water which reduces its water clarity while a number of the above mentioned lakes are shallow and may suffer reduced clarity from turbidity as a result of wind induced disturbance of their bottom sediments.

Some 38 lakes have now been sampled for a number of consecutive years (Table 3). For 15 of these lakes, the mean chlorophyll concentration for 1977 is higher than that reported for the previous year the lake was sampled. Temperance showed the most marked increase from 3.6 ug/l to 8.9 ug/l. However, two very high values of 19 ug/l and 17 ug/l, respectively, were excluded from the determination of the 1976 mean as erronously high values. If these values are included in the calculation of the 1976 mean for Temperance Lake, as now would seem appropriate in light of the 1977 results per Table 4 of this report, the 1976 mean is 7.7 ug/l and the apparent increase in the mean chlorphyll concentration is only about 15%.

Table 3: Mean values for chlorophyll a (micrograms per litre) data for lakes in the Southeastern Region for which two or more years of data are available. (Numbers in brackets are the number of samples used to calculate the mean).

LAKE		1977	1976	1975	1974	1973	1972	1971
1.	Adams	3.2 (9)	3.4 (10)					
3.	Baptiste	2.4 (11)	--	2.1 (10)				
7.	Big Gull	2.0 (8)	2.1 (10)					
8.	Big Rideau	1.4 (33)	2.3 (12)	1.6 (25)				
9.	Black	1.3 (18)	1.4 (11)					
10.	Bobs -							
	- Buck Bay	3.5 (10)	2.6 (6)					
	- Mud Bay	2.5 (6)	4.0 (6)					
11.	Boulter	1.0 (8)	1.5 (7)					
14.	Charleston	2.2 (24)	2.9 (26)					
15.	Christie	3.9 (9)	2.8 (21)					
19.	Collins Bay	3.2 (7)	3.5 (13)					
20.	Coulonge	1.5 (9)	--	1.7 (7)				
25.	Dalhousie	1.6 (10)	2.3 (15)					
27.	Devil	1.7 (20)	1.5 (39)	2.0 (19)	1.6(30)			
33.	Glanmire	1.9 (16)	2.3 (8)					
37.	Green	0.7 (11)	1.6 (8)					

LAKE	1977	1976	1975	1974	1973	1972	1971
38. Grippen	2.1 (10)	3.1 (7)	2.6 (11)				
42. Hurds	2.1 (12)	--	1.7 (10)				
45. Joe Perry	2.5 (6)	1.6 (7)					
46. Kamaniskeg	1.4 (37)	1.2 (7)					1.5(21)
47. Kennebec	1.9 (18)	2.7 (7)					
48. Limerick	1.5 (8)	1.0 (8)	1.1 (9)				
53. Loughborough							
- East Basin	3.7 (17)	2.1 (14)	4.9 (19)	2.7 (17)			
- West Basin	2.2 (16)	2.5 (7)	2.1 (9)				
55. Mackie	1.8 (12)	1.3 (8)			0.5 (7)		
56. Mazinaw	1.2 (29)	1.2 (25)	1.0 (20)				
57. Mink	1.5 (12)	1.8 (11)	1.8 (18)				
58. Mississippi	1.8 (28)	--	--	2.0 (14)	2.2 (6)		
59. Moira -							
- East Basin	7.2 (13)	--	--	9.2 (19)			
64. Ottawa River (near L'Orignal)	1.9 (11)	1.8 (10)					
65. Otter	2.1 (19)	2.4 (14)	1.4 (9)				
66. Otty	1.7 (35)	1.8 (36)	1.8 (32)	1.1 (36)	1.9 (43)		
70. Pike	4.0 (6)	4.4 (15)					

LAKE	1977	1976	1975	1974	1973	1972	1971
74. Sharbot Lake - - West Basin	1.7 (18)	2.0 (10)					
79. Steenburg	2.0 (9)	1.3 (9)					
82. Temperance	8.9 (18)	3.6 (7)					
89. White	3.6 (49)	6.4 (40)	3.5 (34)	2.2 (42)	4.2 (32)		
90. White	1.4 (10)	1.2 (9)	1.3 (9)				

Table 3A: Mean Secchi disc visibility depths (metres) for lakes in the Southeastern Region for which two or more years of data are available.

LAKE		1977	1976	1975	1974	1973	1972	1971
1.	Adams	3.9	4.1					
2.	Baptiste	3.6	-	3.2				
7.	Big Gull	4.6	4.6					
8.	Big Rideau	4.0	4.1	4.5				
9.	Black	5.0	4.2					
10.	Bobs-Buck Bay	3.8	4.8					
	Mud Bay	3.8	3.5					
11.	Boulter	4.0	3.7					
14.	Charleston	4.0	3.9					
15.	Christie	4.4	4.3					
19.	Collins Bay	3.3	2.8	2.8				
20.	Coulonge	3.0	-	3.2				
25.	Dalhousie	4.1	3.9					
27.	Devil	4.8	5.2	5.1	5.7			
33.	Glanmire	3.4	3.2	3.6				
37.	Green	8.3	8.5					
38.	Grippen	2.7	3.9	2.9				
42.	Hurds	4.7	-	4.8				

Table 3A:
cont'd.

LAKE	1977	1976	1975	1974	1973	1972	1971
45. Joe Perry	4.2	4.3					
46. Kamaniskeg	5.1	4.5					
47. Kennebec	3.7	4.1					
48. Limerick	4.7	4.7	5.0				
53. Loughborough							
East Basin	2.8	3.4	2.3	2.7	3.3		
West Basin	3.4	4.5	4.1	-	4.0		
55. Mackie	6.3	6.0	-	-	6.6		
56. Mazinaw	5.7	5.6	5.6				
57. Mink	3.5	3.6	3.8				
58. Mississippi	3.4	-	-	3.6	4.3		
59. Moira							
East Basin	2.4	-	-	2.1	-		
64. Ottawa River (near L'Orignal)	1.7	1.4					
65. Otter	3.0	3.2	3.2				
66. Otty	4.0	4.6	4.5	3.8	4.1		
70. Pike	3.1	2.4					
74. Sharbot							
West Basin	4.2	4.1					
79. Steenburg	4.7	4.3					

Table 3A:
cont'd.

LAKE		1977	1976	1975	1974	1973	1972	1971
82.	Temperance	1.2	1.9					
89:	White	2.8	2.3	3.1	3.0	2.6		
90.	White	4.6	4.8	4.9				

For Joe Perry, Limerick, the east basin of Loughborough, Mackie, and Steenburg Lakes the increase in mean chlorophyll concentrations are significant based on the numbers of samples analysed and the variation of individual chlorophyll values encountered within each lake for the two years under comparison. Further surveillance of these lakes is indicated to determine if a trend towards increasing enrichment may be developing.

Other lakes exhibited a decrease in chlorophyll levels compared to previous summers. Of those lakes that experienced a decline in chlorophyll levels, Black Lake, Mud Bay of Bobs Lake, Boulter, Christie, Charleston, Collins Bay, Dalhousie, Glanmire, Moira, Pike, Sharbot and White Lakes were accompanied by a corresponding increase in their mean Secchi disc visibility depth.

In most cases annual variations in Secchi disc readings and chlorophyll concentrations are minor and can be attributed to year-to-year variations in climate, extent and regularity of sampling and to analytical variability. In regard to the latter factor, our Laboratory Services Branch have advised that the chlorophyll concentrations reported this year may be lower than those reported in previous years owing to a change in the analytical procedure for the determination of chlorophyll concentrations.

This problem, which was related to the selection of the filter used to extract the algae from water samples, has now been indentified and corrected.

In view of the foregoing remarks, any apparent decrease in chlorophyll levels that are not accompanied by a significant corresponding increase in water clarity should be viewed with some caution. Similarly, in future years any apparent increase in chlorophyll concentrations with respect to 1977 values will have to be interpreted in light of possible analytical discrepancy.

In the 1976 report it was stated that continued high chlorophyll concentrations in Salmon Trout Lake in 1976 and 1975 compared to a relatively low value in 1974 warranted further investigation. Salmon Trout Lake was included as one of approximately 38 lakes in a joint Ministry of Environment - Ministry of Natural Resources lake survey program in 1977.

Many lakes in the Self Help Program have been studied as part of the Ministry of the Environment - Ministry of Natural Resources' Lake Survey Program. A "Report on Water Quality Management of Lake Trout Waters in Southeastern Ontario" was published in October 1977 on lake trout waters in Lennox and

Addington, Frontenac, Leeds, Lanark and the southern portion of Hastings Counties. Reports on lake trout waters in Renfrew and the northern portion of Hastings Counties, and the non-lake trout waters in the entire Southeastern Region that have been surveyed to date will be published later this year.

The Self Help Program is an invaluable complement to the Recreational Lakes Survey by providing the Ministry of Environment with an ongoing survellience of water quality conditions in a large number of lakes.

RECOMMENDATIONS

In view of the annual variations in Secchi disc readings and chlorophyll concentrations, sampling is required for a number of years to define long term trends. It is hoped that participants will consider a continuation of their program so that the Ministry of the Environment will have a record of water quality on their lake and be alerted to any deterioration should it occur so that possible remedial action can be taken. Ideally, sampling should be conducted on a weekly basis during the ice-free period of the year.

Owing to a large number of lakes that have not been sampled, additional participation in the program is encouraged. For information and assistance in establishing a Self-Help Program, write to: Self-Help Program, Ontario Ministry of the Environment, P.O. Box 820, 133 Dalton Street, Kingston, Ontario K7L 4X6. Telephone 549-4000.

Table 4: Secchi disc (metres) and chlorophyll *a* (micrograms per litre) data collected from 79 lakes in the Southeastern Region during the summer of 1977. Mean values are also presented.

LAKE		DATE	SECCHI DISC (m)	CHLOROPHYLL a (ug/1)
1.	Adams	May 15	3.4	1.9
		May 29	3.1	1.8
		Aug. 1	4.0	2.1
		Aug. 7	4.0	2.1
		Aug. 14	4.4	4.4
		Aug. 21	3.8	4.0
		Aug. 28	4.4	7.6
		Sept.11	4.0	2.4
		Sept.18	4.1	2.9
		MEAN	3.9	3.2
2.	Ashby	May 24	7.5	1.2
		June 7	6.9	0.9
		June 15	5.9	1.0
		June 21	5.8	1.4
		July 5	6.1	0.7
		July 11	6.3	1.3
		July 19	6.7	0.5
		Aug. 2	6.9	1.6
		Aug. 9	6.7	1.5
		Aug. 16	6.4	2.7
		Sept. 8	7.9	1.4
		Oct. 7	7.8	1.1
		Oct. 13	6.9	1.1
		Oct. 31	7.3	1.1
		MEAN	6.8	1.3
3.	Baptiste Stn. 1	June 15	4.1	1.8
		June 28	3.5	2.5
		July 11	3.2	2.3
		Aug. 2	4.4	1.4
		Aug. 24	3.2	6.7
		Sept. 29	4.4	1.9
		MEAN	3.8	2.8
	Stn. 1	June 15	3.4	1.8
		July 11	3.5	1.5
		Aug. 2	3.5	1.2
		Aug. 24	2.9	2.1
		Sept. 29	3.5	3.3
		MEAN	3.4	2.0

LAKE		DATE	SECCHI DISC (m)	CHLOROPHYLL a (ug/1)
4.	Bass	May 29	1.2	1.2
		June 15	7.8	0.4
		June 26	7.6	0.9
		July 11	7.6	1.5
		July 18	7.0	0.9
		Aug. 7	7.0	0.5
		Aug. 14	6.1	1.4
		Aug. 21	4.9	-
		Sept. 5	6.1	-
		Sept. 24	5.2	0.5
		Oct. 23	5.5	1.5
		MEAN	6.6	1.0
5.	Batelle	June 28	4.1	1.5
6.	Bellamy	May 15	2.7	1.3
		May 23	2.7	1.2
		May 29	2.4	1.0
		June 12	1.8	1.0
		June 27	2.1	1.2
		July 5	2.1	1.1
		Aug. 16	1.8	2.3
		Aug. 29	2.1	2.2
		MEAN	2.2	1.4
7.	Big Gull	July 3	5.2	3.2
		July 9	4.0	1.6
		Aug. 1	3.7	2.2
		Aug. 7	4.6	1.9
		Aug. 15	5.2	1.8
		Aug. 21	4.6	1.6
		Aug. 28	4.9	1.8
		Sept. 5	4.9	2.1
	MEAN		4.6	2.0
8.	Big Rideau near Sand Is.	July 11	4.0	0.6
		July 17	4.0	1.2
		Aug. 4	3.0	1.6
		Aug. 11	3.4	1.4
	near Grindsone Is.	July 24	4.6	0.4
		July 31	4.7	1.7
		Aug. 7	4.7	0.6
		Aug. 17	3.2	2.2
		Aug. 21	3.5	1.5
	near Big Is.	July 4	3.7	1.2
		July 17	4.3	1.2
		Aug. 1	3.7	1.3
		Sept. 4	4.0	2.0

LAKE		DATE	SECCHI DISC	CHLOROPHYLL a (ug/1)
8.	Big Rideau cont'd. Briton Bay	July 27	3.4	1.0
		Aug. 9	3.0	1.8
		Aug. 24	3.4	1.2
		Aug. 29	3.4	-
		Sept.11	3.4	1.2
		Oct. 23	3.4	1.2
	Rocky Narrows	July 4	4.8	1.1
		July 19	4.6	1.2
		Aug. 1	4.0	1.4
		Aug. 14	3.4	1.6
		Aug. 25	3.7	0.7
		Sept. 4	4.3	2.0
	near Star Is.	May 15	3.4	2.3
		May 29	5.2	1.7
		Aug. 1	5.8	1.0
		Aug. 7	3.7	1.4
		Aug. 14	4.4	1.7
		Aug. 21	4.6	1.4
		Aug. 28	4.1	2.7
		Sept.11	5.2	1.7
		Sept.18	4.7	1.8
		MEAN	4.0	1.4
9.	Black	May 18	3.4	1.8
		May 25	3.4	1.0
		June 1	4.6	0.2
		June 8	4.3	1.1
		June 15	3.4	0.5
		June 22	5.5	0.7
		June 29	6.1	1.8
		July 6	5.5	0.7
		July 13	5.5	0.8
		July 20	5.8	0.7
		July 27	5.8	0.9
		Aug. 3	5.8	2.5
		Aug. 10	5.2	1.4
		Aug. 17	5.2	1.5
		Aug. 24	4.9	1.1
		Aug. 31	5.5	1.7
		Sept. 7	6.1	3.1
		Sept.14	4.6	1.4
		MEAN	5.0	1.3

LAKE		DATE	SECCHI DISC	CHLOROPHYL *a* (ug/1)
10.	Bobs A. Buck Bay	April 17	2.6	5.2
		May 15	3.8	5.0
		May 23	4.1	2.0
		June 4	4.9	1.5
		June 11	4.7	1.1
		July 3	4.6	1.7
		Aug. 9	3.8	4.6
		Aug. 14	3.4	4.9
		Aug. 20	3.4	3.5
		Sept. 3	3.2	5.2
		MEAN	3.8	3.5
	B. Mud Bay	June 26	4.4	-
		June 12	3.7	1.6
		June 19	4.1	1.4
		July 3	3.8	2.9
		Aug. 7	3.5	1.1
		Aug. 14	3.2	4.2
		Sept. 5	3.7	3.7
		MEAN	3.8	2.5
11.	Boulter	June 26	4.0	0.4
		July 3	3.7	0.4
		July 10	3.7	1.3
		July 24	4.3	0.8
		Aug. 14	4.3	1.0
		Aug. 21	4.0	0.7
		Aug. 28	4.0	1.7
		Sept.11	4.3	1.5
		MEAN	4.0	1.0
12.	Buck North Bay North End	June 26	3.7	1.5
		July 3	2.9	2.6
		July 10	3.8	2.2
		July 17	2.4	2.5
		July 24	3.0	1.9
		July 31	2.7	2.2
		Aug. 7	3.4	2.1
		Aug. 14	3.2	3.0
		Aug. 28	3.0	0.6
		MEAN	3.1	2.1
	North Bay South End	July 3	3.5	2.2
		July 9	4.0	2.7
		July 17	4.1	2.2
		July 25	3.5	0.5
		July 31	3.5	2.7
		Aug. 7	4.0	3.9
		Aug. 14	4.0	2.7
		Aug. 28	3.6	1.8
		Sept. 4	3.8	3.0
		Sept. 11	3.5	3.4
		MEAN	3.8	2.5

LAKE		DATE	SECCHI DISC (m)	CHLOROPHYLL a (ug/1)
13.	Carson	May 30	7.5	1.4
		June 11	6.9	0.8
		June 23	6.3	0.9
		July 5	6.3	1.4
		July 18	6.6	1.1
		Aug. 8	6.4	1.7
		Aug. 22	6.1	1.4
		Sept. 4	4.6	1.6
		MEAN	6.3	1.3
14.	Charleston Big Water	May 25	4.0	1.6
		June 1	4.3	1.6
		June 13	3.2	2.6
		June 22	3.2	3.4
		June 30	4.0	3.5
		July 7	4.0	2.1
		July 14	4.0	2.9
		July 20	2.4	1.7
		July 27	4.7	1.5
		Aug. 8	4.9	1.5
		Aug. 15	4.3	2.7
		Aug. 29	4.6	2.1
		MEAN	4.0	2.3
	Deep Water	May 25	3.8	1.4
		June 1	3.2	1.7
		June 13	3.8	2.2
		June 22	3.4	3.1
		June 30	3.9	2.6
		July 7	5	2.0
		July 14	4.3	2.7
		July 20	2.6	1.2
		July 27	4.9	1.6
		Aug. 8	4.0	3.0
		Aug. 15	4.6	2.3
		Aug. 13	4.0	2.7
		MEAN	4.0	2.2
15.	Christie	May 8	4.0	-
		May 29	5.8	0.7
		June 12	7.3	0.7
		July 10	5.5	2.1
		July 24	5.6	1.4
		Aug. 14	3.7	3.4
		Aug. 28	3.7	4.3
		Sept. 5	2.7	8.3
		Sept. 25	2.8	5.2
		Oct. 16	2.5	8.8
		MEAN	4.4	3.9

LAKE		DATE	SECCHI DISC (m)	CHLOROPHYLL a (ug/1)
16.	Clear Sebastopol Township	May 30	6.4	1.2
		June 4	5.8	1.9
		July 18	3.8	1.9
		Aug. 3	2.3	1.6
		Aug. 8	2.3	1.6
		Aug. 16	2.1	2.7
		Aug. 30	2.3	1.5
		Sept. 4	2.4	1.6
		Sept. 18	4.0	2.2
		MEAN	3.5	1.8
17.	Clear South Crosby Township	May 29	4.6	1.6
		June 6	4.6	2.3
		June 14	4.9	2.4
		June 19	5.0	1.5
		June 26	3.4	1.9
		July 3	4.0	3.0
		July 17	3.7	3.1
		July 24	3.7	1.7
		Oct. 4	4.2	2.4
		MEAN	4.2	2.2
18.	Clear Bedford Township	Nov. 20	3.7	5.4
19.	Collins Bay	May 29	3.2	4.2
		June 27	3.5	2.4
		July 10	3.2	2.2
		July 14	3.1	2.2
		Aug. 28	3.4	3.2
		Sept. 11	3.2	1.6
		Oct. 22	3.8	6.3
		MEAN	3.3	3.2
20.	Coulonge	May 23	3.1	2.1
		June 26	2.9	2.0
		July 3	2.4	1.6
		July 10	3.4	1.3
		July 17	3.0	0.5
		Aug. 14	2.7	2.2
		Aug. 21	3.0	0.9
		Aug. 28	2.4	1.8
		Sept. 4	4.0	1.5
		MEAN	3.0	1.5
21.	Cranberry	June 14	4.0	0.7
		June 23	3.1	-
		July 4	2.6	4.2
		July 18	2.4	5.4
		July 25	1.7	16.0
		Aug. 8	1.4	3.9
		Aug. 22	1.4	16.0
		Sept. 5	1.2	7.0
		MEAN	2.2	7.6

LAKE		DATE	SECCHI DISC (m)	CHLORPHYLL a (ug/1)
22.	Cronk	Oct. 23	3.8	2.3
		Oct. 30	2.5	4.1
		Nov. 20	2.8	6.6
		MEAN	3.0	4.3
23.	Crow	July 7	4.9	2.2
		July 13	4.3	2.3
		July 22	5.6	0.8
		Aug. 10	5.2	2.5
		Aug. 15	4.6	1.5
		Aug. 18	4.9	1.6
		Aug. 28	4.6	3.0
		Oct. 16	4.6	3.6
		Nov. 20	-	2.4
		MEAN	4.8	2.2
24.	Crowe	Aug. 1	4.6	2.3
		Aug. 9	5.2	0.4
		Sept. 5	1.5	3.6
		Sept. 10	4.3	5.8
		MEAN	3.9	3.0
25.	Dalhousie	July 3	3.5	1.8
		July 10	4.6	1.8
		July 17	3.7	1.8
		July 26	4.9	1.7
		Aug. 1	3.7	1.5
		Aug. 7	3.4	1.1
		Aug. 14	4.3	1.9
		Aug. 21	3.5	1.5
		Aug. 28	3.7	1.6
		Sept. 4	6.1	1.4
		MEAN	4.1	1.6
26.	Desert Stn. 1	July 24	5.2	0.5
		Aug. 1	5.5	1.4
		Aug. 5	4.6	1.6
		Aug. 9	4.9	2.1
		Aug. 18	5.2	2.1
		Sept. 15	4.7	1.2
		Sept. 27	3.4	2.2
		MEAN	4.8	1.6
	Stn. 2	July 24	4.9	1.0
		Aug. 2	5.8	1.6
		Aug. 5	4.6	1.7
		Aug. 9	5.5	2.2
		Aug. 18	5.2	2.7
		Sept. 15	4.3	1.6
		Sept. 27	3.7	2.4
		MEAN	4.9	1.9

LAKE		DATE	SECCHI DISC (m)	CHLOROPHYLL a (ug/1)
26.	Desert cont'd South Bay Stn. 3	July 24	4.3	0.5
		Aug. 1	5.5	1.9
		Aug. 7	4.9	1.7
		Aug. 14	5.5	2.0
		Aug. 21	4.9	2.5
		Aug. 28	4.9	1.8
		Sept. 5	5.6	1.2
		Sept.11	5.5	1.5
		Sept.18	5.2	2.4
		MEAN	5.1	1.7
27.	Devil A. Buce Bay	July 10	5.6	0.6
		July 17	4.8	1.4
		July 24	4.6	0.6
		Aug. 11	5.6	1.0
		Aug. 21	4.9	1.3
		Sept.11	4.3	1.6
		Sept.25	4.2	1.5
		Oct. 16	4.6	2.6
		MEAN	4.8	1.3
	B. West End	July 10	5.5	1.3
		July 17	4.7	1.4
		July 24	4.9	1.2
		Aug. 11	5.5	2.4
		Aug. 21	4.9	3.8
		Sept.11	4.6	1.9
		Sept.25	3.9	0.9
		Oct. 16	4.6	2.9
		MEAN	4.8	2.0
	D.	July 24	4.7	2.1
	E. East End	June 19	5.2	0.9
		Aug. 7	5.0	2.7
		Sept. 5	4.3	1.6
		MEAN	4.8	1.7

LAKE		DATE	SECCHI DISC (m)	CHLOROPHYLL *a* (ug/1)
28.	Dore	May 23	5.2	2.4
		May 29	5.0	1.5
		June 5	4.9	2.8
		June 12	4.9	0.9
		June 27	-	2.8
		July 3	4.1	1.5
		July 10	5.8	2.0
		July 18	5.8	1.3
		July 27	3.8	1.0
		Aug. 7	4.0	3.3
		Sept. 1	-	2.3
		MEAN	4.8	2.0
29.	Draper	June 23	7.1	3.4
		June 26	5.6	1.4
		July 3	5	0.8
		July 10	5.3	1.3
		July 18	5.6	0.9
		July 31	4.8	-
		Aug. 9	4.7	0.8
		Aug. 17	4.4	0.8
		Aug. 21	4.2	0.4
		Aug. 28	5.0	2.6
		Sept. 11	4.4	1.0
		Sept. 18	4.3	1.7
		Sept. 25	-	1.3
		Oct. 2	4.7	0.9
		Oct. 9	4.7	1.8
		Oct. 23	5.0	1.5
		Oct. 30	5.3	1.9
		Nov. 6	4.9	2.1
		Nov. 19	4.1	1.8
		MEAN	5.0	1.5
30.	Eagle	June 11	4.4	1.2
		July 5	4.1	0.7
		July 18	4.6	1.2
		July 24	4.6	1.3
		July 31	4.6	1.6
		Sept. 5	3.7	1.7
		MEAN	4.3	1.3

LAKE	DATE	SECCHI DISC (m)	CHLOROPHYLL a (ug/1)
31. Ellens	May 15	3.5	0.8
	May 29	3.1	0.7
	June 12	3.4	1.1
	June 26	4.3	1.2
	July 3	3.8	2.8
	July 10	4.3	2.1
	Aug. 14	3.4	1.4
	Aug. 21	2.4	2.9
	Aug. 28	3.0	4.9
	Sept. 4	4.1	4.1
	Sept.18	2.9	2.3
	Oct. 10	2.9	2.5
	Oct. 26	4.0	1.8
	MEAN	3.5	2.2
32. Gananoque	June 5	2.1	2.5
	June 12	2.0	2.1
	June 19	2.6	1.7
	June 26	3.4	1.3
	July 3	2.3	1.6
	July 17	2.0	2.9
	July 24	2.1	2.3
	Aug. 1	2.1	2.2
	Aug. 7	2.3	2.2
	Aug. 28	-	4.7
	Sept. 5	2.4	5.8
	Sept.17	2.3	5.6
	Oct. 9	1.5	4.1
	Oct. 28	2.1	4.7
	MEAN	2.2	3.1
33. Glanmire	May 1	3.1	0.8
	May 8	3.7	0.9
	May 15	3.2	-
	May 23	3.7	1.1
	May 29	4.0	0.4
	June 26	3.7	2.1
	July 3	3.0	1.5
	July 10	3.4	1.2
	July 17	4.0	2.1
	July 24	3.0	1.2
	Aug. 1	3.4	2.1
	Aug. 7	4.0	0.6
	Aug.14	3.4	2.6
	Aug.20	4.0	2.8
	Aug.28	3.7	3.2
	Sept. 5	2.7	4.2
	Sept.11	2.1	3.1
	MEAN	3.4	1.9

LAKE	DATE	SECCHI DISC (m)	CHLOROPHYL a (ug/1)
34. Graham	June 19	1.1	2.4
	July 3	1.1	4.5
	July 24	0.9	4.1
	Aug. 7	1.1	2.8
	Aug. 14	1.1	2.5
	Aug. 25	1.2	1.8
	Sept.11	1.5	2.1
	MEAN	1.1	2.9
36. Graphite	July 2	3.4	0.8
	July 23	3.8	0.8
	July 28	4.0	1.5
	Aug. 13	3.0	2.2
	Sept. 4	4.3	3.0
	Sept. 9	3.5	1.6
	Sept.14	5.3	2.7
	Sept.17	3.1	2.7
	Oct. 8	2.0	4.9
	MEAN	3.6	2.2
37. Green	May 23	7.5	0.5
	May 29	7.6	0.5
	June 5	7.6	0.4
	June 12	8.2	0.3
	June 19	8.8	0.4
	June 26	9.3	0.6
	July 3	8.8	0.8
	July 10	9.8	0.9
	July 17	7.8	0.6
	Sept. 5	8.1	1.4
	Sept.18	8.1	1.1
	MEAN	8.3	0.7
38. Grippen	May 23	3.1	4.6
	May 29	2.9	2.8
	June 11	1.4	0.2
	July 15	2.0	1.7
	July 21	2.0	0.8
	July 27	2.9	1.0
	Aug. 22	2.9	2.7
	Aug. 28	3.2	3.1
	Sept. 4	2.6	2.1
	Sept.25	3.5	2.2
	MEAN	2.6	2.1

LAKE	DATE	SECCHI DISC (m)	CHLOROPHYLL a (ug/l)
39. Hambly	Aug. 3	3.4	2.5
	Aug. 11	3.4	2.4
	Aug. 18	3.4	2.9
	Aug. 28	2.7	2.1
	Sept. 11	2.9	0.6
	Sept. 18	3.7	3.4
	Sept. 25	2.6	2.9
	Oct. 1	2.7	3.7
	Nov. 20	3.0	12.6
	MEAN	3.1	3.7
40. Hay Bay	Apr. 13	0.9	31.5
	Apr. 26	1.1	19.0
	May 10	0.9	17.0
	June 9	1.2	7.2
	June 16	1.4	5.4
	June 30	0.9	9.8
	July 27	1.1	11.0
	Aug. 7	0.8	22.0
	Sept. 9	1.1	13.0
	Oct. 13	0.9	35.8
	Oct. 24	1.1	18.2
	Oct. 28	1.5	9.7
	MEAN	1.1	16.6
41. Howes	June 23	2.7	3.3
	June 28	2.4	3.7
	No Date	2.4	4.1
	July 13	2.1	3.0
	July 18	2.4	3.6
	July 27	4.3	4.3
	July 28	2.0	3.6
	Aug. 1	3.0	3.4
	No Date	2.1	3.2
	Aug. 12	1.8	6.3
	Aug. 14	1.7	4.5
	Aug. 19	1.7	8.9
	Aug. 24	1.5	5.6
	Aug. 30	3.0	4.4
	Sept. 9	-	2.8
	Sept.15	-	2.7
	Sept.22	-	3.6
	Sept.30	-	3.6
	MEAN	2.4	4.1

LAKE	DATE	SECCHI DISC (m)	CHLOROPHYLL a (ug/1)
42. Hurds	June 19	4.4	1.3
	June 26	4.7	3.1
	July 3	4.9	2.7
	July 10	5.0	2.1
	July 17	4.9	1.2
	July 24	5.0	2.0
	July 31	4.8	1.1
	Aug. 7	5.2	1.3
	Aug. 14	4.8	2.7
	Aug. 28	4.7	2.6
	Sept. 4	3.7	2.8
	Sept.18	4.7	2.5
	MEAN	4.7	2.1
43. Indian	June 5	3.7	2.7
	June 16	4.3	1.6
	July 3	3	2.2
	July 11	2.9	2.1
	July 18	3	2.2
	July 26	4.0	1.1
	Aug. 8	4.0	2.4
	MEAN	3.6	2.0
44. Inverary	Aug. 17	2.1	9.3
	No Date	2.1	-
	No Date	1.8	19.2
	MEAN	2.0	14
45. Joeperry	June 22	3.7	2.4
	July 7	4.0	1.6
	July 20	5.2	3.0
	Aug. 3	4.9	4.3
	Aug. 17	3.0	2.6
	Aug. 31	4.3	1.3
	MEAN	4.2	2.5

LAKE	DATE	SECCHI DISC (m)	CHLOROPHYLL a (ug/1)
46. Kamaniskeg A. East side of Mask Is.	June 8	4.1	1.3
	June 14	4.3	1.3
	June 23	4.6	0.3
	June 28	5.2	1.2
	July 5	5.5	1.4
	July 11	4.6	1.0
	July 18	6.4	1.0
	July 26	4.6	1.8
	Aug. 4	4.9	0.7
	Aug. 9	5.8	1.6
	Aug. 15	5.8	2.1
	Aug. 22	4.9	1.6
	Aug. 30	5.5	1.7
	Sept. 6	5.2	1.9
	Sept.15	5.2	1.2
	Sept. 28	4.9	2.3
	Oct. 3	4.9	1.9
	Oct.11	5.2	1.6
	Oct.18	5.2	1.4
	MEAN	5.1	1.4
B. West side of Mask Is.	June 8	3.7	1.3
	June 16	3.7	0.8
	June 23	4.9	1.4
	June 28	5.5	1.2
	July 5	5.5	1.6
	July 11	4.9	1.6
	July 18	6.4	1.8
	July 26	4.3	1.6
	Aug. 4	5.2	0.6
	Aug. 9	6.1	2.0
	Aug. 15	6.1	1.4
	Aug. 22	5.2	1.3
	Aug. 30	5.8	2.0
	Sept. 6	5.2	2.1
	Sept.15	4.9	-
	Sept.28	4.9	1.7
	Oct. 3	4.9	1.9
	Oct. 11	5.2	1.0
	Oct. 18	5.2	1.7
	MEAN	5.1	1.5
47. Kennebec A. East End	Apr. 17	2.3	2.0
	May 23	3.4	1.9
	May 29	3.5	0.1
	June 5	4.0	2.6
	June 26	3.5	1.8
	July 3	3.7	2.2
	July 10	4.1	2.3
	Aug. 7	3.7	1.7
	Aug. 14	3.8	2.0
	Sept.11	4.6	2.0
	MEAN	3.7	1.9

LAKE		DATE	SECCHI DISC (m)	CHLOROPHYLL a (ug/1)
47.	Kennebec cont'd. B. West End	May 29	3.2	1.0
		June 5	4.1	1.0
		June 26	3.4	2.3
		July 3	3.4	2.7
		July 10	3.6	3.0
		Aug. 7	4.3	1.4
		Aug. 14	4.0	1.9
		Sept.11	4.0	1.7
		MEAN	3.7	1.9
48.	Limerick	May 24	4.9	0.5
		June 30	5.2	1.1
		July 5	4.6	0.7
		July 18	4.9	1.6
		July 29	4.3	0.9
		Aug. 9	4.9	2.2
		Aug. 18	4.0	3.7
		Oct. 11	4.6	1.4
		MEAN	4.7	1.5
49.	Little Black	Nov. 20	1.5	11.0
		Nov. 27	1.8	12.1
		MEAN	1.6	11.6
50.	Little Long	Aug. 4	4.6	1.0
		Sept. 10	5.0	3.1
		Sept. 18	5.0	4.5
		MEAN	4.9	2.9
51.	Little Silver	July 10	5.0	1.7
		July 17	4.6	2.6
		July 25	4.1	5.2
		Aug. 1	3.8	5.4
		Aug. 7	4.3	4.3
		Aug. 21	3.7	5.0
		Aug. 28	4.3	2.9
		Sept. 5	4.4	6.7
		Sept.11	3.8	7.9
		Sept.18	4.3	8.1
		MEAN	4.2	5.0
52.	Long	May 23	3.8	1.5
		June 12	2.7	2.1
		June 26	2.7	5.8
		July 14	2.0	4.6
		July 27	2.1	3.3
		Aug. 18	1.8	7.8
		Sept. 5	1.7	7.6
		MEAN	2.4	4.7

LAKE		DATE	SECCHI DISC (m)	CHLORPHYLL a (ug/1)
53.	Loughborough A. East Basin	June 21	2.7	4.2
		June 27	3.1	2.5
		July 6	2.9	2.2
		July 13	2.7	2.8
		July 20	3.0	2.5
		July 28	2.3	5.9
		Aug. 4	2.1	3.2
		Aug. 11	2.3	3.3
		Aug. 19	2.7	1.8
		Aug. 25	3.4	3.2
		Sept. 1	3.4	3.0
		Sept.11	2.9	6.2
		Sept.27	2.4	5.5
		Oct. 4	2.9	2.9
		Oct. 11	2.9	4.9
		Oct. 19	3.4	5.1
		Oct. 27	2.8	3.8
		MEAN	2.8	3.7
	B. West Basin	May 8	3.8	-
		May 15	3.7	-
		May 23	2.3	2.7
		May 27	3.0	1.4
		June 4	3.4	3.8
		June 6	3.4	-
		June 13	3.4	1.9
		June 13	3.4	-
		June 20	2.9	2.2
		June 26	4.3	1.7
		June 28	5.0	-
		July 5	4.0	1.4
		July 8	4.3	-
		July 10	2.9	2.6
		July 17	3.4	2.5
		July 17	3.3	-
		July 24	2.3	1.6
		July 25	3.0	-
		July 31	2.6	2.8
		July 31	3.0	-
		Aug. 7	2.6	2.0
		Aug. 15	2.9	1.5
		Aug. 25	3.8	2.3
		Aug. 28	4.0	1.2
		Sept. 24	3.5	3.0
		MEAN	3.4	2.2

LAKE		DATE	SECCHI DISC (m)	CHLOROPHYLL a (ug/1)
54.	Lower Beverly	July 14	2.6	-
		July 21	2.3	3.0
		July 28	2.1	2.7
		Aug. 4	1.7	6.8
		Aug. 11	1.7	2.2
		Aug. 18	1.4	14.0
		Aug. 25	1.7	8.2
		Sept. 1	1.4	4.0
		Sept. 4	1.5	4.9
		Sept. 8	3.2	2.8
		Sept. 11	3.2	2.6
		Sept. 15	3.2	2.2
		Sept. 18	4.4	1.8
		Sept. 22	2.7	5.2
		Sept. 25	3.0	6.6
		Sept. 29	3.8	4.0
		Oct. 6	2.3	10.4
		Oct. 23	2.0	5.6
		Oct. 30	2.4	6.6
		MEAN	2.4	5.2
55.	Mackie	Apr. 24	6.7	2.1
		May 1	6.0	1.9
		May 15	5.0	1.7
		June 12	6.9	0.8
		June 19	5.8	0.8
		July 10	7.0	1.3
		July 17	6.7	2.4
		July 24	6.4	1.1
		Aug. 7	6.1	1.9
		Aug. 21	6.4	1.8
		Aug. 28	6.4	2.1
		Oct. 10	6.1	3.7
		MEAN	6.3	1.8
56.	Mazinaw Lower	Apr. 17	7.2	7.2
		May 15	5.6	0.9
		May 23	4.9	0.7
		May 29	5.6	0.7
		June 5	4.9	1.9
		June 12	5.8	0.7
		June 26	5.8	0.7
		July 3	5.5	1.4
		July 10	6.4	1.0
		July 17	6.1	1.1
		July 25	5.5	0.7
		Aug. 2	5.5	1.4
		Aug. 15	6.1	1.8
		Aug. 22	6.1	1.9
		Aug. 29	6.0	1.9
		Sept. 6	6.4	1.5
		Sept.11	7.3	1.1

LAKE		DATE	SECCHI DISC (m)	CHLORPHYLL a (ug/l)
56.	Mazinaw cont'd. Lower	Sept.15	8.2	0.9
		Sept.25	5.5	1.0
		Oct. 2	5.5	1.4
		Oct. 9	6.1	1.5
		Oct. 16	6.1	1.4
		MEAN	6.0	1.2
	Upper	June 8	4.9	0.9
		June 22	4.9	0.9
		July 7	4.9	1.0
		July 20	5.2	0.6
		Aug. 3	4.9	1.5
		Aug. 17	3.0	2.6
		Aug. 31	6.3	0.9
		MEAN	4.9	1.2
57.	Mink	May 24	3.5	1.5
		May 30	3.7	0.6
		June 20	2.9	1.1
		June 27	3.7	2.4
		July 4	3.7	0.8
		July 11	3.1	1.1
		July 18	3.7	1.3
		Aug. 1	3.5	1.8
		Aug. 8	3.7	1.2
		Aug. 30	3.2	1.7
		Sept. 12	3.1	1.8
		Oct. 24	4.0	2.5
		MEAN	3.5	1.5
58.	Mississippi Big Lake	July 17	4.9	1.4
		July 31	4.6	1.2
		Aug. 7	4.0	1.9
		Aug. 15	4.0	2.2
		Aug. 28	4.3	1.3
		MEAN	4.4	1.6
	Third Lake	June 20	3.0	2.6
		June 27	3.4	1.1
		July 5	3.5	1.9
		July 13	3.4	1.6
		July 17	4.0	1.4
		July 26	3.7	0.9
		Aug. 1	4.0	1.6
		Aug. 7	4.0	3.4
		Aug. 15	3.4	1.9
		Aug. 23	3.8	1.7
		Aug. 30	2.6	2.8
		Sept. 6	3.0	1.6
		Sept.12	4.1	1.5
		MEAN	3.5	1.8

LAKE		DATE	SECCHI DISC (m)	CHLORPHYLL a (ug/1)
58.	Mississippi Cont'd. First Lake	June 20	2.6	2.7
		June 27	2.3	0.9
		July 4	-	1.6
		July 12	2.3	1.6
		July 18	-	2.1
		July 25	2.6	4.5
		Aug. 2	2.3	1.6
		Aug. 14	2.6	1.6
		Aug. 23	2.6	1.4
		Sept. 6	2.7	1.5
		MEAN	2.5	2.0
59.	Moira East Basin	June 9	2.9	2.8
		June 20	3.1	3.2
		July 11	1.7	2.8
		July 20	1.5	0.8
		July 28	1.8	2.6
		Aug. 9	1.5	8.6
		Aug. 17	1.4	7.3
		Aug. 24	1.5	11.0
		Oct. 12	1.8	7.3
		Oct. 20	2.9	10.8
		Nov. 3	2.0	20.7
		Nov. 22	2.4	8.3
		Nov. 29	7	7.5
		MEAN	2.4	7.2
60.	Mosque Stn. 1	May 21	5.8	0.9
		June 18	6.6	1.0
		July 3	5.5	2.0
		July 17	5.8	1.5
		Aug. 1	4.6	1.7
		Aug. 21	4.3	1.4
		Sept. 4	5.2	2.0
		Oct. -	4.6	3.8
		MEAN	5.3	1.8
	Stn. 2	May 21	5.2	0.9
		June 18	6.1	1.0
		July 3	4.9	2.1
		July 17	5.8	1.3
		Aug. 1	4.6	2.1
		Aug. 21	4.6	1.6
		Sept. 4	5.2	1.0
		Oct. -	4.6	3.2
		MEAN	5.1	1.6
	Stn. 3	May 21	4.0	1.7
		June 18	4.4	3.3
		July 3	3.5	3.2
		July 17	4.3	2.7
		Aug. 1	3.5	3.0
		Aug. 21	3.4	2.4
		Sept. 4	4.6	1.6
		Oct. -	3.7	5.4
		MEAN	3.9	2.9

LAKE	DATE	SECCHI DISC (m)	CHLOROPHYLL a (ug/l)
61. Muskrat	July 31	2.0	5.1
	July 31	2.0	4.3
	Aug. 7	1.8	3.1
	Aug. 7	1.8	3.2
	Aug. 7	1.7	11.0
	Aug. 7	1.4	17.0
	Aug. 21	1.5	9.8
	Aug. 21	1.5	14.0
	Aug. 21	1.2	28.0
	Aug. 21	1.2	18.0
	Sept. 5	2.1	8.3
	Sept. 5	1.8	5.1
	Sept. 5	2.1	14.9
	Sept. 5	1.8	2.5
	MEAN	1.7	10.3
62. Olmstead	June 12	7.6	0.4
	June 26	7	0.6
	July 10	6.1	0.9
	July 24	6.7	0.9
	Aug. 7	6.7	0.9
	Aug. 21	5.8	5.4
	Sept. 3	6.7	1.2
	Sept.18	6.7	1.4
	Oct. 2	4.3	2.0
	Oct. 12	5.5	1.6
	Oct. 31	5.0	1.4
	Nov. 15	7.3	0.4
	MEAN	6.3	1.4
63. Opinicon	June 5	3.5	2.4
	June 12	3.7	2.3
	June 22	3.5	2.0
	July 3	3.4	3.1
	July 17	2.7	2.1
	July 24	2.4	2.1
	Aug. 1	2.7	3.5
	Aug. 7	2.6	0.4
	Aug. 15	2.3	3.8
	Aug. 21	2.4	3.1
	Aug. 28	2.4	3.2
	Sept. 5	2.7	2.8
	Sept.11	2.6	2.6
	MEAN	2.8	2.6

LAKE		DATE	SECCHI DISC (m)	CHLOROPHYLL a (ug/1)
64.	Ottawa River	May 24	1.7	1.3
		June 3	1.4	0.6
		June 12	1.4	1.3
		June 16	1.4	1.4
		June 21	1.4	2.1
		June 28	2	3.8
		July 14	2	1.7
		July 21	2	1.6
		Aug. 1	1.4	2.0
		Aug. 21	1.7	2.4
		Sept. 6	2.0	2.5
		MEAN	1.7	1.9
65.	Otter	June 19	4.6	-
		July 4	4	2.6
		July 4	4.4	1.4
		July 11	3.5	1.9
		July 13	2.7	1.6
		July 17	2.7	0.8
		July 24	3.0	1.7
		July 28	2.6	1.4
		Aug. 2	3.0	1.9
		Aug. 2	2.7	1.8
		Aug. 7	2.7	1.5
		Aug. 11	2.6	3.5
		Aug. 15	2.4	2.5
		Aug. 21	2.4	2.5
		Aug. 25	2.7	2.7
		Aug. 28	1.8	2.8
		Aug. 31	2.9	2.4
		Sept. 8	3.4	2.1
		Sept.11	2.7	1.8
		Oct. 4	3.5	2.9
		MEAN	3.0	2.1
66.	Otty Stn. A	May 23	3.3	1.5
		May 29	3.3	2.0
		June 5	3.2	2.1
		June 12	3.5	1.0
		June 19	3.5	1.7
		June 26	4.3	1.5
		July 3	4	1.4
		July 10	4.9	1.9
		July 17	4.3	1.8
		July 24	4.0	0.8
		Aug. 1	4.0	1.6
		Aug. 7	4.3	1.8
		Aug. 14	4.6	1.7
		Aug. 21	3.4	2.1
		Aug. 28	4.7	-
		Sept. 5	4.3	1.8
		Sept.11	4.6	1.3
		Sept.18	4.3	2.1
		MEAN	4.0	1.7

LAKE		DATE	SECCHI DISC. (m)	CHLOROPHYLL a (ug/1)
66.	Otty cont'd. Stn. B.	May 23	3.1	1.8
		May 29	3.1	1.2
		June 5	3.4	1.4
		June 12	3.8	1.1
		June 19	3.5	2.3
		June 26	4.3	1.2
		July 3	4.0	1.8
		July 10	4.6	1.7
		July 17	4.0	2.3
		July 24	3.7	1.4
		Aug. 1	4.0	2.0
		Aug. 7	4.0	2.0
		Aug. 14	4.6	2.8
		Aug. 21	4.6	1.7
		Aug. 28	4.6	1.7
		Sept. 5	4.9	1.6
		Sept.11	4.6	1.5
		Sept.18	4.9	2.0
		MEAN	4.1	1.8
67.	Palmerston	June 19	7.9	0.7
		June 26	8.2	0.8
		July 3	7.3	4.5
		July 17	7.9	1.0
		Aug. 1	7.6	2.3
		Aug. 7	8.2	1.1
		Aug. 21	7.3	1.6
		Aug. 28	5.2	1.1
		Aug. 28	6.7	2.1
		Sept. 5	5.8	1.2
		Sept.11	6.4	1.5
		MEAN	7.1	1.6
68.	Papineau	June 23	8.5	2.7
		July 10	8.5	1.6
		Aug. 1	6.4	1.4
		MEAN	7.8	1.9
69.	Patterson	July 24	5.2	1.5
70.	Pike	June 19	2.9	2.3
		June 26	3.2	2.3
		July 10	3.5	3.5
		July 17	4.1	1.9
		Aug. 28	2.6	6.1
		Sept. 5	2.1	8.2
		MEAN	3.1	4.1

LAKE		DATE	SECCHI DISC (m)	CHLOROPHYLL a (ug/l)
71.	Presqu'ile Bay	July 18	3.2	3.3
		July 25	3.2	1.5
		Aug. 1	2.7	1.6
		Aug. 7	2.3	1.3
		Aug.15	2.0	1.9
		Aug.25	2.3	3.3
		MEAN	2.6	2.2
72.	Round	May 15	4.4	1.4
		May 23	3.0	2.8
		July 3	4	3.8
		July 18	5.2	1.0
		Aug. 8	6.1	2.1
		Aug. 15	5.2	2.1
		MEAN	4.6	2.2
73.	Salmon Trout	May 15	3.4	5.1
		May 29	4.0	2.7
		June 5	3.1	3.6
		MEAN	3.5	3.8
74.	Sharbot West Basin	May 11	3.4	2.1
		May 18	3.4	2.0
		May 25	3.7	1.6
		June 1	3.4	0.4
		June 8	3.7	2.2
		June 15	3.4	1.0
		June 22	4.6	1.3
		June 29	4.9	1.8
		July 6	4.3	-
		July 13	4.3	1.8
		July 20	4.6	1.2
		July 27	4.6	1.3
		Aug. 3	4.9	3.5
		Aug. 10	4.0	2.1
		Aug. 17	4.3	0.7
		Aug. 24	4.0	1.4
		Aug. 31	4.9	2.0
		Sept. 7	4.9	2.9
		Sept. 14	4.3	1.9
		MEAN	4.2	1.7
75.	Silver East End	May 24	4.1	1.5
		June 7	3.8	1.1
		June 15	3.8	1.7
		MEAN	3.9	1.4

LAKE		DATE	SECCHI DISC (m)	CHLORPHYLL a (ug/l)
75.	Silver cont'd West End	June 6	4.1	1.1
		June 24	4.6	1.5
		July 3	3.4	2.1
		July 10	3.8	1.0
		July 20	3.2	0.8
		July 25	3.0	1.4
		Aug. 1	2.6	2.0
		Aug. 7	2.9	1.8
		Aug. 14	2.7	1.8
		Aug. 20	2.9	2.2
		Aug. 30	3.4	-
		Sept. 6	3.5	1.1
		Sept.11	3.5	1.7
		Sept.19	3.5	2.4
		Sept.26	3.2	1.2
		Oct. 6	3.7	2.3
		MEAN	3.4	1.6
76.	Spectacle North Basin	June 12	3.7	2.1
		June 19	2.6	3.0
		June 26	2.9	1.2
		June 26	-	1.8
		June 26	-	1.9
		June 26	-	1.2
		July 11	3.0	2.3
		July 17	3.4	3.6
		July 29	3.4	2.6
		Aug. 4	3.5	4.0
		Aug. 14	4.0	2.9
		Aug. 22	3.5	2.7
		Sept.18	3.0	2.1
		MEAN	3.3	2.4
	South Basin	June 12	4.3	1.0
		June 19	4.6	1.9
		June 26	5.2	0.6
		July 11	4.8	4.7
		July 17	5.5	2.2
		July 29	5.5	1.5
		Aug. 4	4.9	1.5
		Aug. 14	4.9	1.8
		Aug. 22	4.6	1.7
		Sept.18	4.9	1.3
		MEAN	4.9	1.8
77.	Spring	Oct. 23	-	7.1
		Oct. 30	3.0	6.6
		Nov. 20	-	23.6

LAKE		DATE	SECCHI DISC (m)	CHLOROPHYLL a (ug/1)
78.	St. Andrew	July 19	-	1.0
		July 28	2.6	1.5
		Aug. 8	2.2	1.1
		Aug. 23	2.3	2.6
		Sept.26	2.0	8.5
		Oct. 3	1.9	9.5
		Oct. 10	2.0	11.0
		Oct. 18	2.0	5.2
		Oct. 24	1.5	7.0
		Nov. 2	1.3	10.8
		Nov. 9	1.3	10.9
		Nov. 20	1.6	4.8
		Nov. 27	1.5	15.2
		MEAN	1.8	6.8
79.	Steenburg	May 23	5.2	2.4
		June 26	4.9	1.5
		July 10	5.0	-
		July 24	4.3	0.7
		July 24	4.9	0.2
		July 31	4.9	2.4
		Aug. 7	4.6	2.5
		Sept. 1	4.6	3.7
		Oct. 10	3.7	2.4
		Nov. 5	5.2	1.9
		MEAN	4.7	2.0
80.	St. Peter	June 26	3.7	0.4
		Aug. 14	4.0	1.4
		Aug. 28	3.0	2.0
		MEAN	3.6	1.3
81	Sydenham	July 21	3.8	3.3
		July 21	5.0	2.2
		Aug. 4	5.2	5.3
		Aug. 4	5.0	2.5
		Aug. 19	4.6	4.9
		Aug. 19	5.0	2.4
		Aug. 19	5.3	2.8
		Aug. 19	5.5	4.3
		Aug. 22	4.5	2.2
		Aug. 22	4.3	3.8
		Aug. 22	5.4	2.8
		Aug. 22	5.5	2.7
		Sept.10	5.3	3.7
		Sept.10	5.3	1.2
		Sept.10	4.5	4.1
		Sept.18	5.3	4.7
		Sept.18	5.2	2.8
		MEAN	5.0	3.4

LAKE		DATE	SECCHI DISC (m)	CHLOROPHYLL a (ug/l)
81.	Sydenham cont'd. Eel Bay	July 21	4.6	2.0
		Aug. 4	4.0	4.2
		Sept. 18	4.4	3.1
		MEAN	4.3	3.1
82.	Temperance	May 15	2.4	2.1
		May 21	2.7	1.6
		May 29	2.4	2.5
		June 5	2.3	5.2
		June 12	1.5	2.3
		June 18	1.2	2.9
		June 26	1.4	3.0
		July 3	1.3	10.0
		July 10	1.1	9.9
		July 17	0.9	14.0
		July 24	0.8	14.0
		July 31	0.7	17.0
		Aug. 7	0.6	-
		Aug. 14	0.6	14.0
		Aug. 21	0.5	20.0
		Aug. 28	0.4	21.0
		Sept. 4	0.3	12.0
		Sept. 12	0.6	1.5
		Sept. 18	1.1	6.4
		MEAN	1.2	8.9
83.	Thirty Island	May 23	5.3	2.1
		May 29	6.1	-
		June 5	5.5	3.0
		June 13	5.0	9.4
		June 19	4.9	1.1
		July 3	6.4	5.6
		July 10	6.1	1.0
		July 24	5.8	1.5
		Aug. 6	4.4	1.9
		Aug. 12	4.4	1.4
		Aug. 14	4.1	2.2
		Aug. 28	4.0	0.8
		Sept. 4	4.6	1.8
		Oct. 2	4.3	2.8
		Oct. 30	4.3	2.3
		MEAN	5.0	2.6

LAKE		DATE	SEECHI DISC (m)	CHLOROPHYLL a (ug/1)
84.	Troy	May 29	2.6	3.1
		June 5	2.1	3.1
		June 26	2.1	3.0
		July 3	1.8	5.4
		July 18	1.8	4.3
		July 25	1.7	5.9
		Aug. 1	1.5	3.9
		Aug. 7	1.5	2.2
		Aug. 21	1.2	11.0
		Aug. 28	1.2	9.4
		Sept.18	2.4	15.6
		Oct. 10	1.2	11.9
		Oct. 23	1.4	11.1
		MEAN	1.7	6.9
85.	Twin Sister West Basin	June 12	4.3	0.4
		June 19	4.1	0.4
		June 26	3.4	1.7
		July 3	3.4	3.0
		July 10	4.0	2.3
		July 17	2.7	1.2
		July 24	3.4	2.3
		Aug. 1	3.4	3.7
		MEAN	3.6	1.9
86.	Upper Rideau	June 19	3.2	3.1
		July 10	3.8	2.3
		July 17	2.9	3.1
		July 24	3.2	0.2
		Aug. 1	1.7	7.0
		Aug. 7	1.5	9.2
		Aug. 14	1.7	11.0
		Aug. 21	2.0	6.5
		Sept. 4	3.8	-
		Sept.11	2.6	4.3
		Sept.18	2.6	-
		MEAN	2.6	5.2
87.	Verona	June 10	2.5	3.6
		No Date	2.7	1.6
		No Date	2.3	6.0
		Aug. 3	2.1	5.0
		Aug. 11	1.8	6.1
		Aug. 18	2.1	6.0
		Aug. 28	2.4	5.7
		Sept.11	2.1	6.4
		Sept.18	1.5	14.9
		Sept.25	1.5	11.6
		Oct. 1	1.5	5.9
		Nov. 20	2.6	11.5
		MEAN	2.1	7.0

LAKE		DATE	SECCHI DISC (m)	CHLOROPHYLL a (ug/l)
88.	VanLuven	June 20	2.5	-
		July 4	2.8	1.9
		July 11	2.8	2.8
		July 18	1.4	1.6
		July 25	1.5	1.8
		Aug. 2	1.4	3.1
		Aug. 8	1.5	5.0
		Aug. 15	1.2	3.2
		Aug. 22	1.5	2.8
		Aug. 29	1.7	7.0
		Sept. 5	1.2	3.1
		Sept.12	1.5	1.6
		Sept.17	1.5	1.0
		Sept.27	1.4	1.8
		Oct. 2	1.4	2.3
		Oct. 10	1.5	0.7
		MEAN	1.7	2.6
89.	White Stn. 1	May 23	3.3	0.7
		May 29	3.4	1.3
		June 5	2.6	4.0
		June 13	2.3	2.3
		June 19	2.3	4.7
		July 3	2	5.9
		July 10	2.7	0.8
		July 17	2.7	3.1
		Aug. 1	2.1	6.3
		Aug. 7	1.8	4.6
		Aug. 21	2.2	3.6
		Aug. 28	2.0	5.8
		Sept. 5	2.6	2.7
		Sept.10	4.9	4.1
		Sept.18	2.6	6.7
		Sept.24	2.3	6.3
		Oct. 23	4.1	6.2
		Oct. 30	4.6	3.1
		MEAN	2.8	4.0
	Stn. 2	May 23	3.4	2.4
		May 29	4.0	2.0
		June 13	2.4	4.1
		June 19	2.3	3.9
		July 3	2.4	4.6
		July 10	3	0.9
		July 17	2.6	2.7
		Aug. 1	2.0	5.0
		Aug. 7	2.1	-
		Aug. 21	2.1	4.9
		Aug. 28	1.8	3.6
		Sept. 5	2.6	1.7
		Sept. 10	5.5	5.5
		Sept. 18	2.6	7.9
		Sept. 24	2.3	3.1
		Oct. 23	4.4	3.7
		Oct. 30	4.4	3.6
		MEAN	2.9	3.7

LAKE		DATE	SECCHI DISC (m)	CHLOROPHYLL a (ug/1)
89.	White cont'd. Stn. 3	May 23	4.0	1.5
		May 29	3.5	1.2
		June 5	2.8	2.8
		June 13	2.4	4.9
		June 19	2.4	3.7
		July 3	2.7	3.8
		July 10	2.7	1.2
		July 17	2.7	1.8
		Aug. 1	1.8	1.9
		Aug. 7	2.1	-
		Aug. 21	1.8	4.9
		Aug. 28	2.0	3.8
		Sept. 5	2.3	3.0
		Sept.18	2.3	6.0
		Oct. 23	4.1	2.9
		Oct. 30	4.4	2.8
		MEAN	2.8	3.1
90.	White Olden Township	May 23	4.7	1.3
		June 19	5.2	0.9
		June 26	5.2	1.7
		July 3	4.9	2.0
		July 10	5.2	1.3
		July 16	4.6	0.8
		Aug. 1	4.4	2.3
		Aug. 7	4.3	0.7
		Aug. 14	4.0	1.9
		Aug. 20	4.0	1.1
		MEAN	4.6	1.4
91.	Whitefish	May 23	3.1	1.4
		June 5	4.0	2.5
		June 12	3.4	2.3
		June 19	3.7	2.8
		June 26	3.7	1.6
		July 3	4.0	3.7
		July 18	2.7	3.1
		July 25	3.0	5.9
		Aug. 1	1.8	12.0
		Aug. 7	1.8	4.2
		Aug. 15	1.5	7.3
		Aug. 22	1.5	7.5
		Aug. 29	1.7	0.9
		Sept. 5	2.0	5.1
		Sept.11	2.0	5.5
		Sept.18	2.1	5.0
		MEAN	2.6	4.4

LAKE		DATE	SECCHI DISC (m)	CHLOROPHYLL a (ug/1)
92.	Wolfe	Nov. 20	3.0	14.8
		Nov. 27	3.7	13.4
		MEAN	3.4	14.1
93.	Wollaston	June 25	5.2	1.1
		July 3	4.9	1.3
		July 10	5.5	1.3
		July 17	3.4	-
		July 24	4.6	0.6
		Aug. 1	4.9	1.7
		Aug. 7	5.2	0.8
		Aug. 15	6.4	1.9
		MEAN	5.0	1.2

APPENDIX A

INFORMATION OF GENERAL INTEREST TO COTTAGERS

MICROBIOLOGY OF WATER

For the sake of simplicity, the micro-organisms in water can be divided into two groups; the bacteria that thrive in the lake environment and make up the natural bacterial flora; and the disease causing microorganisms, called pathogens, that have acquired the capacity to infect human tissues.

The "pathogens" are generally introduced to the aquatic environment by raw or inadequately treated sewage, although a few are found naturally in the soil. The presence of these bacteria does not change the appearance of the water but poses an immediate public health hazard if the water is used for drinking or swimming. The health hazard does not necessarily mean that the water user will contract serious waterborn infections such as typhoid fever, polio or hepatitis, but he may catch less serious infections of gastroenteritis (sometimes called stomach flu), dysentery or diarrhea. Included in these minor afflictions are eye, ear and throat infections that swimmers encounter every year and the more insidious but seldom diagnosed, subclinical infections usually associated with several water born viruses. These viral infections leave a person not feeling well enough to enjoy holidaying although not bedridden. This type of microbial pollution can be remedied by preventing wastes from reaching the lake and water quality will return to satifactory conditions within a relatively short time (approximately 1 year) since disease causing bacteria usually do not thrive in an aquatic environment.

The rest of the bacteria live and thrive within the lake environment. These organisms are the instruments of biodegradation. Any organic matter in the lake will be used as food by these organisms and will give rise in turn to subsequent increases in their numbers. Natural organic matter as well as that from sewage, kitchen wastes, oil and gasoline are readily attacked by these lake bacteria. Unfortunately, biodegradation of the organic wastes by organisms uses correspondingly large amounts of the dissolved oxygen. If the organic matter content of the lake gets high enough, these bacteria will deplete the dissolved oxygen supply in the bottom waters and threaten the survival of many deep water fish species.

RAINFALL AND BACTERIA

The "Rainfall Effect" relates to a phenomenon that has been documented in previous surveys of recreational lakes. Heavy precipitation has been shown to flush the land area around the lake and the subsequent runoff will carry available contaminants including sewage organisms as well as natural soil bacteria with it into the water.

Total coliforms, fecal coliforms and fecal streptococci, as well as other bacteria and viruses which inhabit human waste disposal systems, can be washed into the lake. In Precambrian areas where there is inadequate soil cover and in fractured limestone areas where fissures in the rocks provide access to the lake, this phenomenon is particularly evident.

Melting snow provides the same transportation function for bacteria, especially in an agricultural area where manure spreading is carried out in the winter on top of the snow.

Previous data from sampling points situated 50 to 100 feet from shore indicate that contamination from shore generally shows up within 12 to 48 hours after a heavy rainfall.

WATER TREATMENT

Lake and river water is open to contamination by man, animals and birds (all of which can be carriers of disease); consequently, NO RIVER OR LAKE WATER MAY BE CONSIDERED SAFE FOR HUMAN CONSUMPTION without prior treatment, including disinfection. Disinfection is especially critical if coliforms have been shown to be present.

Disinfection can be achieved by:

(a) Boiling
Boil the water for a minimum of five minutes to destroy the disease causing organisms.

(b) Chlorination using a household bleach containing 4 to 5 1/4% available chlorine.
Eight drops of a household bleach solution should be mixed with one gallon of water and allowed to stand for 15 minutes before drinking.

(c) Continuous Chlorination

For continuous water disinfection, a small domestic hypochlorinator (sometimes coupled with activated charcoal filters) can be obtained from a local plumber or water equipment supplier.

(d) Well Water Treatment

Well water can be disinfected using a household bleach (assuming strength at 5% available chlorine) if the depth of water and diameter of the well are known.

CHLORINE BLEACH

Per 10 ft. Depth of Water

Diameter of Well Casing in Inches	One to Ten Coliforms	More than Ten Coliforms
4	.5 oz.	1 oz.
6	1 oz.	2 oz.
8	2 oz.	4 oz.
12	4 oz.	8 oz.
16	7 oz.	14 oz.
20	11 oz.	22 oz.
24	16 oz.	31 oz.
30	25 oz.	49 oz.
36	35 oz.	70 oz.

Allow about six hours of contact time before using the water.

Another bacteriological sample should be taken after one week of use.

Water Sources (spring, lake, well, etc.) should be inspected for possible contamination routes (surface soil, runoff following rain and seepage from domestic waste disposal sites). Attempts at disinfecting the water alone without removing the source of contamination will not supply bacteriologically safe water on a continuing basis.

There are several types of low cost filters (ceramic, paper, carbon, diatomaceous earth sometimes impregnated with silver, etc.) that can be easily installed on taps or in water lines. These may be useful in removing particles, if water is periodically turbid, and are usually very successful. Filters, however, do not disinfect water but may reduce bacterial numbers. For safety, chlorination of filtered water is recommended.

SEPTIC TANK INSTALLATIONS

In Ontario provincial law requires under Part 7 of the Environmental Protection Act that before you extend, alter, enlarge or establish any building where a sewage system will be used, a Certificate of Approval must be obtained from the Ministry of the Environment or its representatives. The local municipality or Health Unit may be delegated the authority to issue the Certificate of Approval. Any other pertinent information such as size, types and location of septic tanks and tile fields can also be obtained from the same authority.

(i) General Guidelines

A septic tank should not be closer than:

- 50 feet to any well, lake, stream, pond, spring, river or reservoir
- 5 feet to any building
- 10 feet to any property boundary

The tile field should not be closer than:

- 100 feet to the nearest dug well
- 50 feet to a drilled well which has a casing to 25 feet below ground
- 25 feet to a building with a basement that has a floor below the level of the tile in the tile bed
- 10 feet to any other building
- 10 feet to a property boundary
- 50 feet to any lake, stream, pond, spring, river or reservoir.

The ideal location for a tile field is in a well drained, sandy loam soil remote from any wells or other drinking water sources. For the tile field to work satisfactorily, there should be at least 3 feet of soil between the bottom of the weeping tile trenches and the top of the ground water table or bedrock.

DYE TESTING OF SEPTIC TANK SYSTEMS

There is considerable interest among cottage owners to dye test their sewage systems, however, several problems are associated with dye testing. Dye would not be visible to the eye from a system that has a fairly direct connection to the lake. Thus, if a cottager dye-tested his

system and no dye was visible in the lake, he would assume that his system is satisfactory, which might not be the case. A low concentration of dye is not visible and therefore expensive equipment such as a fluorometer is required. Only qualified people with adequate equipment are capable of assessing a sewage system by using dye. In any case, it is likely that some of the water from a septic tank will eventually reach the lake. The important question is whether all contaminants including nutrients have been removed before it reaches the lake. To answer this question special knowledge of the system, soil depth and composition, underground geology of the region and the shape and flow of the shifting water table are required. Therefore, we recommend that this type of study should be performed only by qualified professionals.

BOATING & MARINA REGULATIONS

In order to help protect the lakes and rivers of Ontario from pollution, it is required by law that sewage (including garbage) from all pleasure craft, including houseboats, must be retained in suitable equipment. Equipment which is considered suitable by the Ministry of the Environment includes (1) retention devices with or without re-circulation which retain all toilet wastes for disposal ashore, and (2) incinerating devices which reduce all sewage to ash.

Equipment for storage of toilet wastes shall:

1. be non-portable
2. be constructed of structurally sound material
3. have adequate capacity for expected use
4. be properly installed, and
5. be equipped with the necessary pipes and fittings conveniently located for pump-out by shore-based facilities (although not specified, a pump-out deck fitting with 1½-inch diameter National Pipe Thread is commonly used).

An Ontario regulation requires that marinas and yacht clubs provide or arrange pump-out service for the customers and members who have toilet-equipped boats. In addition, all marinas and yacht clubs must provide litter containers that can be conveniently used by occupants of pleasure boats.

The following "Tips" may be of assistance to you in boating:

1. Motors should be in good mechanical condition and properly tuned.
2. When a tank for outboard motor testing is used, the contents should not be emptied into the water.
3. If the bilge is cleaned, the waste material must not be dumped into the water.
4. Fuel tanks must not be overfilled and space must be left for expansion if the fuel warms up.
5. Vent pipes should not be obstructed and fuel needs to be dispensed at a correct rate to prevent "blow-back"
6. Empty oil cans must be deposited in a leak-proof receptacle, and
7. Slow down and save fuel.

ICE-ORIENTED RECREATIONAL ACTIVITIES

The Ministry of the Environment is presently preparing a regulation to prevent pollution from ice-oriented recreational activities.

Garbage or sewage left on the ice pollutes the lakes or rivers. The bottoms of ice shelters (ice-fishing huts) or other debris, if left on the ice, may become a hazard later on to boaters and water skiers or a litter problem on some cottager's beach. While bathing, summer vacationists have been badly cut by broken glass and other sharp objects reportedly left on the ice by winter anglers.

With the anticipated enforcement of the regulations, all of these offences will be subject to stricter control.

EUTROPHICATION OR EXCESSIVE FERTILIZATION AND LAKE PROCESSES

In recent years, cottagers have become aware of the problems associated with nutrient enrichment of recreational lakes and have learned to recognize many of the symptoms characterizing nutrient enriched (eutrophic) lakes. It is important to realize that small to moderate amounts of aquatic plants and algae are necessary to maintain a balanced aquatic environment. They provide food and a suitable environment for the growth of aquatic invertebrate organisms which serve as food for fish. Shade from large aquatic plants helps to keep the lower water cool, which is essential to certain species of fish and also provides protection for young game and forage fish. Numerous aquatic plants are utilized for food and/or protection by many species of waterfowl. However, too much growth creates an imbalance in the natural plant and animal community particularly with respect to oxygen conditions, and some desirable forms of life such as sport fish are eliminated and unsightly algae scums can form. The lake will not be "dead" but rather abound with life which unfortunately is not considered aesthetically pleasing. This change to poor water quality becomes apparent after a period of years during which extra nutrients are added to the lake and return to the natural state may also take a number of years after the nutrient inputs are stopped.

Changes in water quality with depth are a very important characteristic of a lake. Water temperatures are uniform throughout the lake in the early spring and winds generally keep the entire volume well mixed. Shallow lakes may remain well mixed all summer so that water quality will be the same throughout. On the other hand, in deep lakes, the surface waters warm up during late spring and early summer and float on the cooler more dense water below. The difference in density offers a resistance to mixing by wind action and many lakes do not become fully mixed again until the surface waters cool down in the fall. The bottom water received no oxygen from the atmosphere during this unmixed period and the dissolved oxygen supply may be all used up by bacteria as they decompose organic matter. Cold water fish, such as trout, will have to move to the warm surface waters to get oxygen and because of the high water temperatures they will not thrive, so that the species will probably die out (see Figure next page).

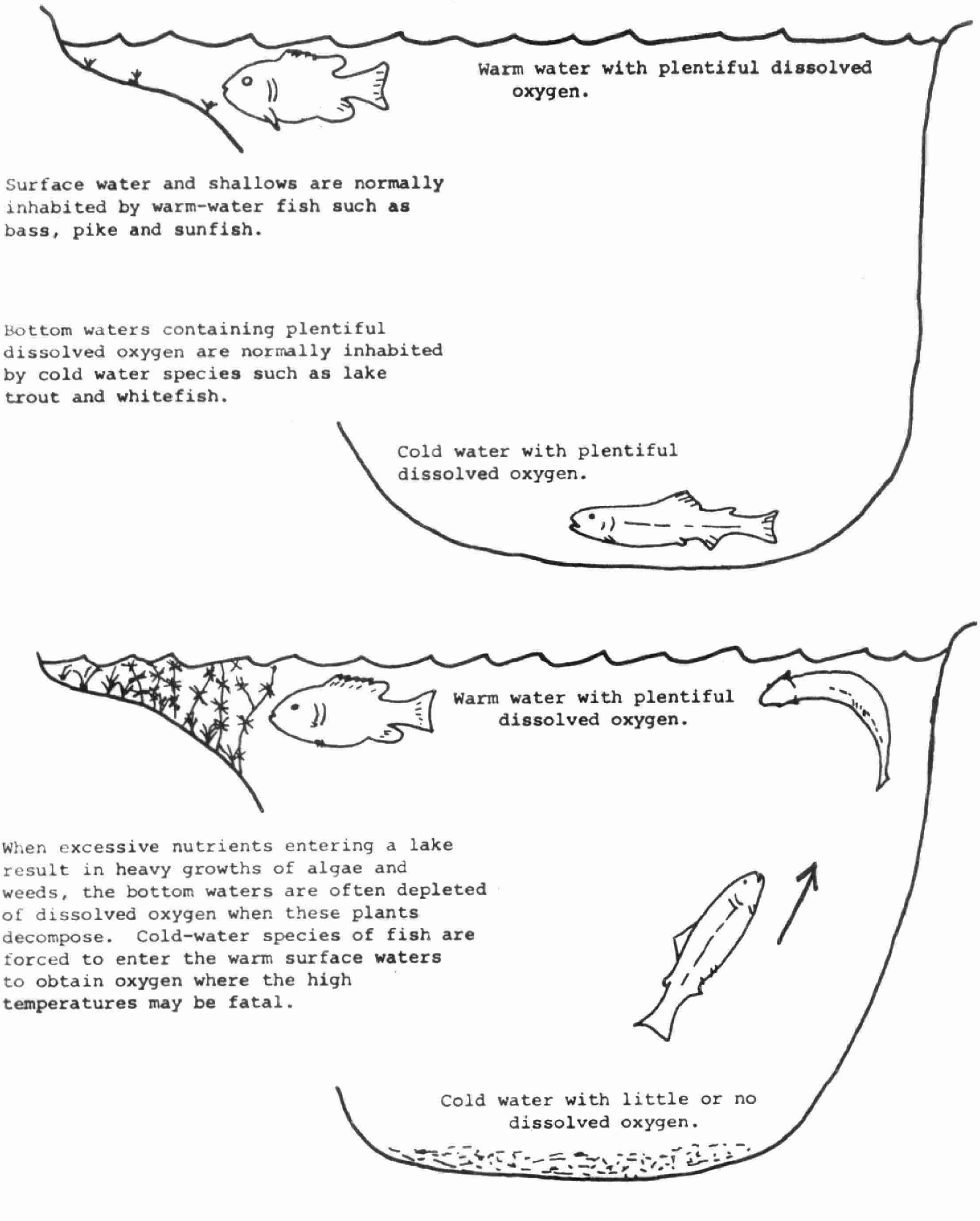


FIGURE A-1: DECOMPOSITION OF PLANT MATTER AT THE LAKE BOTTOM CAN LEAD TO DEATH OF DEEP-WATER FISH SPECIES.

Low oxygen conditions in the bottom waters are not necessarily an indication of pollution but excessive aquatic plant and algae growth and subsequent decomposition in the bottom waters can aggravate the condition and in some cases result in zero oxygen levels in lakes which had previously held some oxygen in the bottom waters all summer. Although plant nutrients normally accumulate in the bottom waters of lakes, they do so to a much greater extent if there is no oxygen present. These nutrients become available for algae in the surface waters when the lake mixes in the fall and dense algae growths can result. Consequently, lakes which have no oxygen in the bottom water during the summer are more prone to having algae problems and more vulnerable to nutrient inputs than lakes which retain some oxygen.

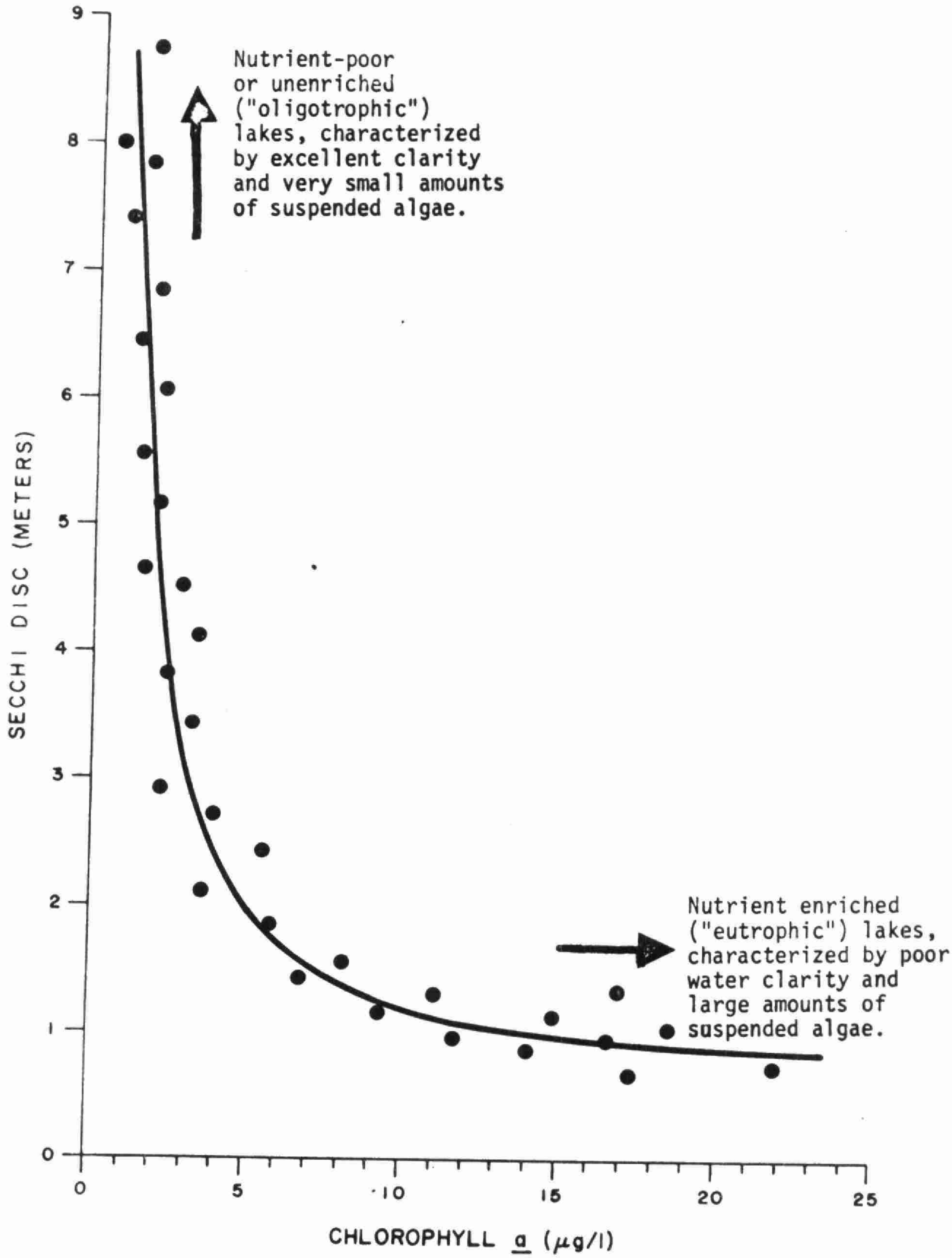
Like humans, aquatic plants and algae require a balanced "diet" for growth. Other special requirements including those for light and temperature are specific for certain algae and plants. Chemical elements such as nitrogen, phosphorus, carbon, and several others are required and must be in forms which are available for uptake by plants and algae. Growth of algae can be limited by scarcity of any single "critical" nutrient. Nitrogen and phosphorus are usually considered "critical" nutrients because they are most often in scarce supply in natural waters, particularly in lakes in the Precambrian area of the province. Phosphorus, especially is necessary for the processes of photosynthesis and cell division. Nitrogen and phosphorus are generally required in the nitrate-N (or ammonia-N) and phosphate forms and are present in natural land runoff and precipitation. Human and livestock wastes are a very significant source of these and other nutrients for lakes in urban and agricultural areas. It is extremely important that cottage waste disposal systems function so that seepage of nutrients to the lake does not occur since the changes in water quality brought about by excessive inputs of nutrients to lakes are usually evidenced by excessive growths of algae and aquatic plants.

The large amounts of suspended algae which materialize from excessive inputs of nutrients, result in turbid water of poor clarity or transparency. On the other hand, lakes with only small, natural inputs of nutrients and correspondingly low nutrient concentrations

(characteristically large and deep lakes) most often support very small amounts of suspended algae and consequently are clear-water lakes. An indication of the degree of enrichment of lakes can therefore be gained by measuring the density of suspended algae (as indicated by the chlorophyll a concentration - the green pigment in most plants and algae) and water clarity (measured with a Secchi disc). In this regard staff of the Ministry of the Environment have been collecting chlorophyll a and water clarity data from several lakes in Ontario and have developed a graphical relationship between these parameters which is being used by cottagers to further their understanding of the processes and consequences of nutrient enrichment of Precambrian lakes. The figure on the following page illustrates the above mentioned relationship.

In the absence of excessive coloured matter (eg. drainage from marshlands), lakes which are very low in nutrients are generally characterized by small amounts of suspended algae (ie. chlorophyll a) and are clear-water lakes with high Secchi disc values. Such lakes, with chlorophyll a and Secchi disc values lying in the upper lefthand area of the graph are unenriched or nutrient-poor ("oligotrophic") in status and do not suffer from the problems associated with excessive inputs of nutrients. In contrast, lakes with high chlorophyll a concentrations and poor clarity are positioned in the lower right-hand area of the graph and are enriched ("eutrophic"). These lakes usually exhibit symptoms of excessive nutrient enrichment including water turbidity owing to large amounts of suspended algae which may float to the surface and accumulate in sheltered areas around docks and bays.

Measurements of suspended algal density (chlorophyll a) and water clarity are especially valuable if carried out over several years. Year to year positional changes on the graph can then be assessed to determine whether or not changes in lake water quality are materializing so that remedial measures can be implemented before conditions become critical.



Nutrient-poor or unenriched ("oligotrophic") lakes, characterized by excellent clarity and very small amounts of suspended algae.
Nutrient enriched ("eutrophic") lakes, characterized by poor water clarity and large amounts of suspended algae.
SECCHI DISC (METERS)
CHLOROPHYLL a (µg/l)
0
1
2
3
4
5
6
7
8
9
0
5
10
15
20
25

CONTROL OF AQUATIC PLANTS AND ALGAE

Usually aquatic weed growths are heaviest in shallow shoreline areas where adequate light and nutrient conditions prevail.

Extensive aquatic plant and algal growths sometimes interfere with boating and swimming and ultimately diminish shoreline property values.

Control of aquatic plants may be achieved by either chemical or mechanical means. Chemical methods of control are currently the most practical, considering the ease with which they are applied. However, the herbicides and algicides currently available generally provide control for only a single season. It is important to ensure that an algicide or herbicide which kills the plants causing the nuisance, does not affect fish or other aquatic life and should be reasonable in cost. At the present time, there is no one chemical which will adequately control all species of algae and other aquatic plants. Chemical control in the province is regulated by the Ministry of the Environment and a permit must be granted prior to any operation. Simple raking and chain dragging operations to control submergent species hae been successfully employed in a number of situations; however, the plants soon re-establish

themselves. Removal of weed by underwater mowing techniques is certainly the most attractive method of control and is currently being evaluated in Chemung Lake near Peterborough. Guidelines and summaries of control methods, and applications for permits are available from the local district offices or the Southeastern Region, Ministry of the Environment, 133 Dalton Street, Kingston, Ontario K7L 4X6, Telephone 549-4000.

PHOSPHORUS AND DETERGENTS

Scientists have recognized that phosphorus is the key nutrient in stimulating algal and plant growth in lakes and streams.

In the past years, approximately 50% of the phosphorus contributed by municipal sewage was added by detergents. Federal regulations reduced the phosphate content as P_2O_5 in laundry detergents from approximately 50% to 20% on August 1, 1970 and to 5% on January 1, 1973.

It should be recognized that automatic dishwashing compounds were not subject to the government regulations and that surprisingly high numbers of automatic dishwashers are present in resort areas (a questionnaire indicated that about 30% of the cottages in the Muskoka Lakes have automatic dishwashers). Cottagers utilizing such conveniences may be contributing significant amounts of phosphorus to recreational lakes. Indeed, in most of Ontario's vacation land, the source of domestic water is soft enough to allow the exclusive use of liquid dishwashing compounds, soap and soap-flakes.

ONTARIO'S PHOSPHORUS REMOVAL PROGRAMME

By 1975, the Government of Ontario expects to have controls in operation at more than 200 municipal wastewater treatment plants across the province serving some 4.7 million persons. This represents about 90% of the population serviced with sewers. The programmes response to the International Joint Commission recommendations as embodied in the Great Lakes Water Quality Agreement and studies carried out by the Ministry of the Environment on inland recreational waters which showed phosphorus to be a major factor influencing eutrophication. The programmes makes provision for nutrient control in the Upper and Lower Great Lakes, the Ottawa River system and in prime recreational waters where the need is demonstrated or where emphasis is placed upon prevention of localized eutrophication.

Phosphorus removal facilities became operational at wastewater treatment plants on December 31, 1973, in the most critically affected areas of the province, including all of the plants in the Lake Erie drainage basin and the inland recreational areas. The operational date for plants discharging to waters deemed to be in less critical condition, which includes plants larger than one million gallons per day (1 mgd) discharging to Lake Ontario and to the Ottawa River System, is December 31, 1975. The 1973 phase of the program involved 113 plants, of which 48 are in prime recreational areas. An additional 53 new plants, each with phosphorus removal, are now under development, 23 of which are located in recreational areas. The capacities of these plants range from 0.04 to 24.0 mgd, serving an estimated population of 1,600,000 persons.

The 1975 phase will bring into operation another 54 plants ranging in size from 0.3 to 180 mgd serving an additional 3,100,000 persons. Treatment facilities utilizing the Lower Great Lakes must meet effluent guidelines of less than 1.0 milligram per litre of total phosphorus in their final effluent. Facilities utilizing the Upper Great Lakes, the Ottawa River Basin and certain areas of Georgian Bay where needs have been demonstrated must remove at least 80% of the phosphorus reaching their sewage treatment plants.

CONTROL OF BITING INSECTS

Mosquitoes and blackflies often interfere with the enjoyment of recreational facilities at the lake-side vacation property. Pesticidal spraying or fogging in the vicinity of cottages produces extremely temporary benefits and usually do not justify the hazard involved in contaminating the nearby water. Eradication of biting fly populations is not possible under any circumstances and significant control is rarely achieved in the absence of large-scale abatement programmes involving substantial funds and trained personnel. Limited use of approved larvicides in small areas of swamp or in rain pools close to residences on private property may be undertaken by individual landowners, but permits are necessary wherever treated waters may contaminate adjacent streams or lakes. The use of repellents and light traps is encouraged as are attempts to reduce mosquito larval habitat by improving land drainage. Applications for permits to apply insecticides as well as technical advice can be obtained from the local district offices or the Southeastern Region, Ministry of the Environment, 133 Dalton Street, Kingston, Ontario K7L 4X6, Telephone 549-4000.

GLOSSARY OF TERMS

ALGAE - An assemblage of simple, mostly microscopic non-vascular plants containing photosynthetic pigments such as chlorophyll. Algae occur suspended in water (phytoplankton) and attached to rock and other suitable substrates. Some algae may produce nuisance conditions when environmental parameters are suitable for prolific growth.

CHLOROPHYLL - The photosynthetic green pigment which occurs in all algal divisions.

EUPHOTIC ZONE - The lighted region that extends vertically from the water surface to the level at which photosynthesis fails to occur due to insufficient light penetration.

EUTROPHIC - Waters containing advanced nutrient enrichment and characterized by a high rate of organic production.

EUTROPHICATION - The process of becoming increasingly enriched in nutrients. It refers to the entire complex of changes which accompanies increasing nutrient enrichment. The result is the production of dense nuisance growths of algae and aquatic weeds which generally degrade water quality and render the lake unsuitable for many recreational activities.

MESOTROPHIC - Water characterized by a moderate nutrient supply and organic production (i.e. midway between eutrophic and oligotrophic).

OLIGOTROPHIC - Waters containing a small nutrient supply and consequently characterized by low rates of organic production.

SECCHI DISC - A circular metal plate, 20 centimeters in diameter, the upper surface of which is divided into four equal quadrants and so painted that two quadrants directly opposite each other are painted black and the intervening ones white. The Secchi disc is used to estimate the depth of the euphotic zone.

DATE	ISSUED TO